AVIATION WEEK

A McGRAW-HILL PUBLICATION

July 23, 1956 50 cents

Red Air Expansion Backed by Vast Training Program

Convair 440 at Brussels

USAF Reveals New Instrument Concept

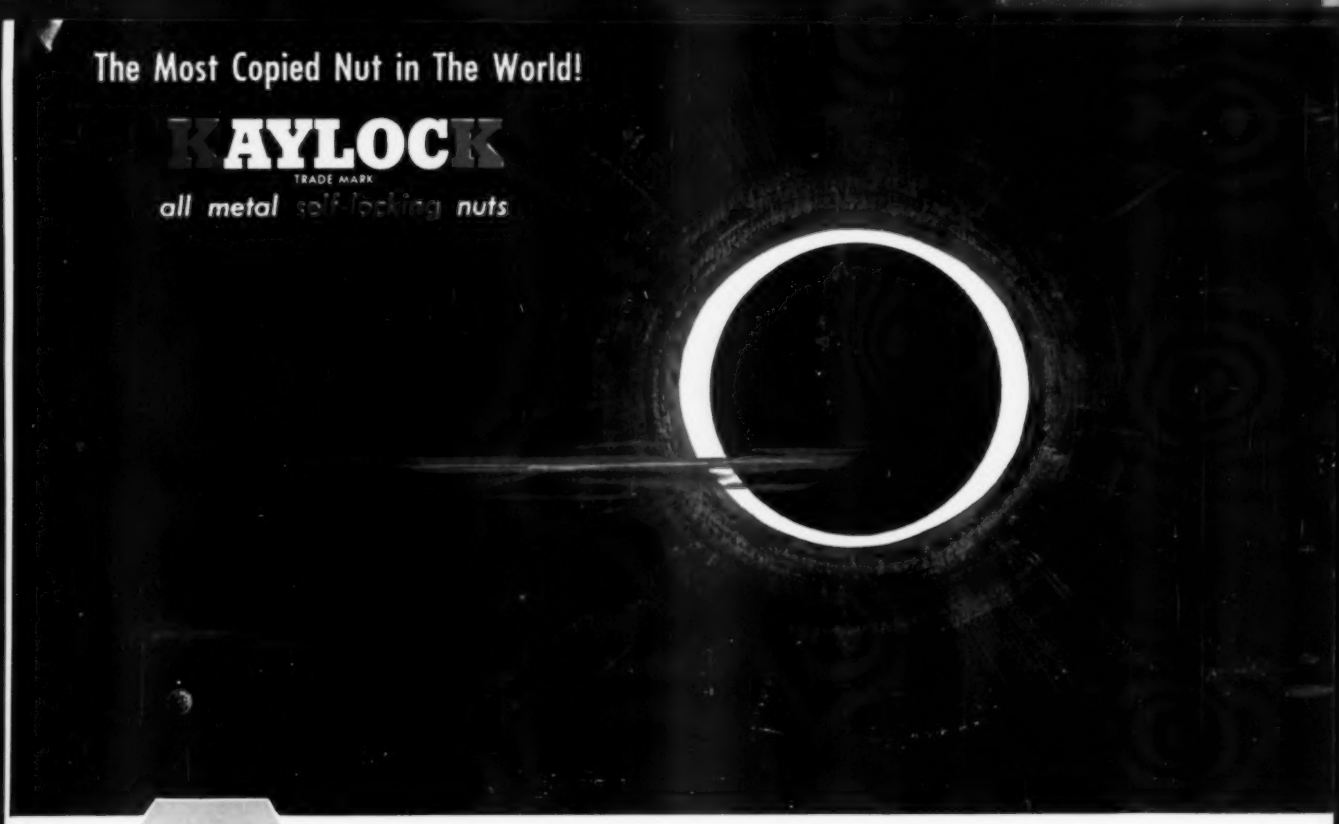
Air Taxi Business To Hit $20 Million

The Most Copied Nut in The World!

KAYLOCK

TRADE MARK

all metal self-locking nuts



. . . the ellipse that can't be **eclipsed!**

Emulated, but never equalled . . Kaylock's unique elliptical self-locking device provides the utmost in nut fastener locking dependability.

Developed specifically to meet the high standards required in aircraft, electronics and guided missiles.

Lightest • Lowest • Strongest • Infinite Reuseability

Kaylock all metal, self-locking nuts are available in hex nuts, both standard and miniature, anchor nuts and gang channel configurations. All are precision products, produced in full conformance with Air Force-Navy specifications AN-N-5 and AN-N-10.

Standard Anchor Nut

Fixed Floating

Miniature Anchor Nut

Fixed Floating

MAIL COUPON TODAY

The Kaynar Company
Kaylock Division Dept. 801
Box 2001, Terminal Annex, Los Angeles 54, California

GENTLEMEN:
Please send me, without charge, your new drafting template #2 on Kaylock self-locking anchor nuts._____
I would also like Template #1 on miniature Kaylock all metal, self-locking nuts._____

Name_____

Company_____

Position_____

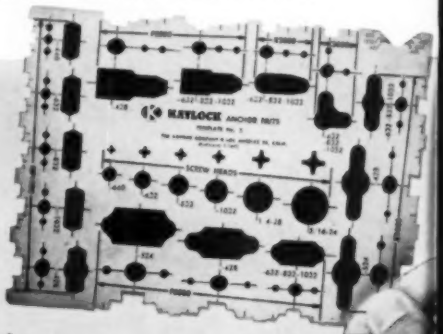
Address_____

City_____ Zone_____ State_____

FREE!

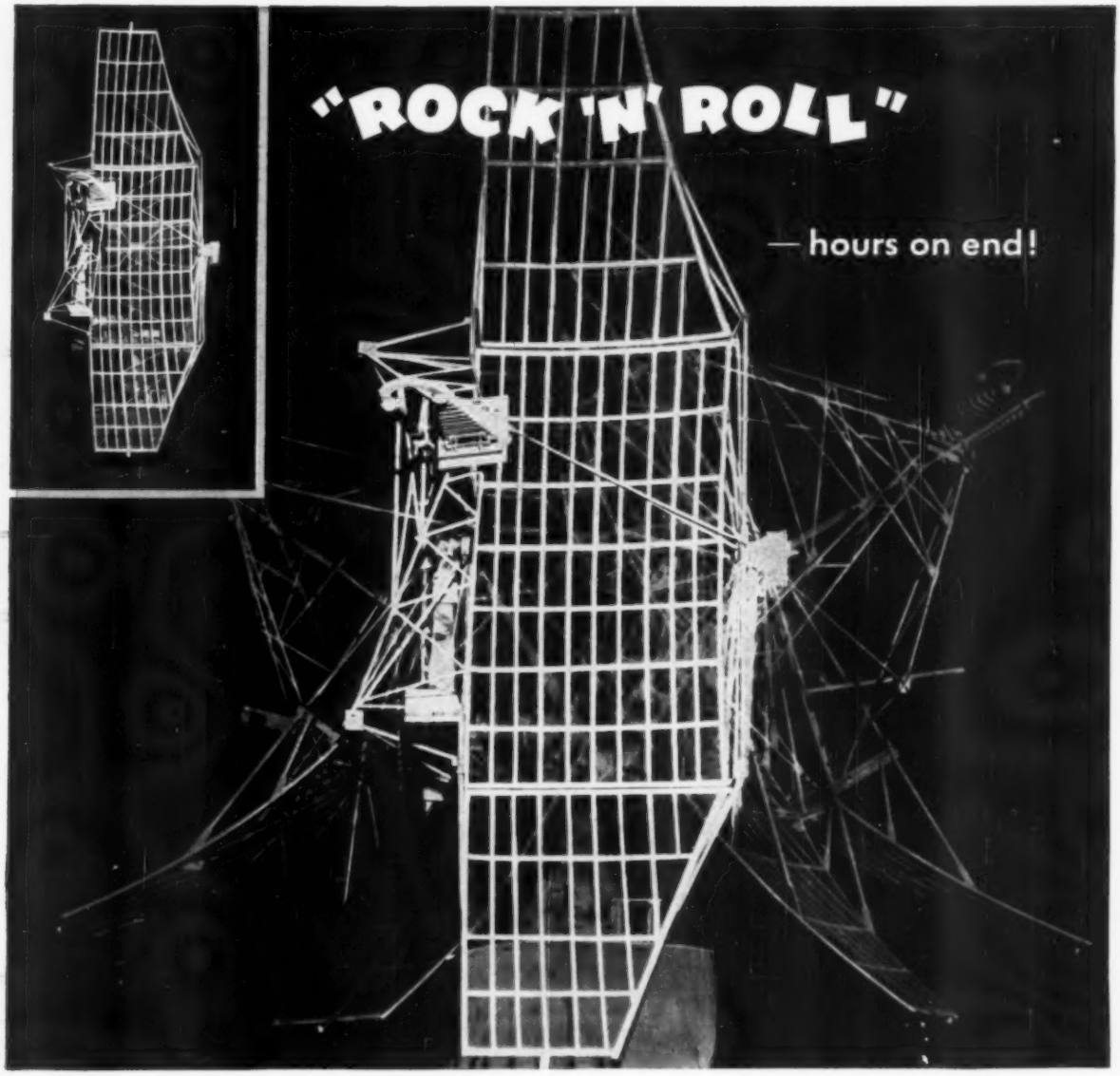
KAYLOCK
DRAFTING TEMPLATE #2

Covers full line of Kaylock standard self-locking anchor nuts. Includes single-lug, corner type, floating anchor nut styles, and guides for drawing recessed head screws in plan and profile views. Send for it!



THE KAYNAR COMPANY • KAYLOCK DIVISION
BOX 2001, TERMINAL ANNEX • LOS ANGELES 54, CALIF.

Canadian Distributor: Abercorn Aero Limited, Montreal



Outside our Akron, Ohio, facility you'll find height-finding radar equipment like this going through their torturous gyrations day and night—making 360° sweeps as they nod up and down to check vertical tilt, rotation and high-power transmission.

For these are complete AN/FPS-6 radar antenna structures being checked out by Goodyear Aircraft Corporation before delivery to our customer, General Electric.

It is the culmination of a host of metal-working skills—the end result of welding techniques and close-tolerance fabrication perfected at Goodyear Aircraft.

The reflector "dish," for example, must be built to a critical 30-foot contour—in order to give an exacting beam pattern.

The entire unit must be rugged—able to perform day in and day out without serious interruptions for maintenance—operate in hurricane winds and at -65°F.

Yet with all this, the Goodyear-built structure has to be mobile—able to be disassembled, transported by trailers, and set up on a new location in a matter of hours.

Developed by the Heavy Military Electronic Equipment Department of General Electric Company, in co-operation with the Rome Air Development Center, United States Air Force—the AN/FPS-6 height-finder is a good example of the kinds of metals engineering to be had when you bring in Goodyear Aircraft Corporation on fabrication problems.

In structural plastics, electronics, weapons systems, and myriad other fields, the results are equally satisfying.

They're doing big things at **GOODYEAR AIRCRAFT**

Rewarding Careers for Engineers • Plants in Akron, Ohio, and Litchfield Park, Arizona

9 major airlines—over 100 companies—specified Bendix Weather Radar!

Over 35,000 flight hours!
That is the proven record to date behind Bendix* RDR-1 Weather Radar. That is why more and more major air lines and companies that operate their own aircraft are specifying Bendix Weather Radar.

With the RDR-1, pilots can see ahead up to 150 miles, get a true picture of the weather that confronts them. Even at night or under instrument conditions, the RDR-1 sees rainclouds, snow and hail . . . locates and pinpoints turbulent areas of any size and intensity . . . and reveals safe passageways through or around them.

In addition to improving flight safety through storm areas, the RDR-1 can be used as a navigational aid and for terrain mapping. And, unlike other manufacturers, Bendix offers you a choice of either C-Band (5.5 cm) or X-Band (3.2 cm), depending on your operational requirements.

For further information about the RDR-1, air lines are requested to contact the Aviation Manager, Bendix Radio. Companies interested in installing Bendix Weather Radar on their aircraft can get complete data from their nearest Bendix Radio Sales and Service specialist. Write for his address and a copy of our booklet, "Bendix Airborne Radar Systems." No obligation, of course.

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PAA GRACE
PAN AMERICAN GRACE AIRWAYS SYSTEM, INC.

AVIATION CALENDAR

July 31-Aug. 9—23rd Annual U. S. National Soaring Competitions, **Aug. 5**—Air Show, Grand Prairie Airport, Texas.

Aug. 1-5—Air Force Association's 1956 National Convention and Airpower Panorama, Roosevelt Hotel, New Orleans, La.

Aug. 6-8—Society of Automotive Engineers National West Coast Meeting, Mark Hopkins Hotel, San Francisco, Calif.

Aug. 7-9—Air Transport Association Standard Practices Committee Meeting, Palace Hotel, San Francisco, Calif.

Aug. 15-17—Institute of the Aeronautical Sciences, National Turbine-Powered Air Transportation Meeting, Grand Hotel, San Diego, Calif.

Aug. 22-24—Bendix Aviation Corp.'s 1956 International Ignition Conference, Sidney, New York.

Aug. 27-29—Association for Computing Machinery, University of California Westwood Campus, Los Angeles.

Sept. 1-3—1956 National Aircraft Show, Oklahoma City.

Sept. 4-6—Society of British Aircraft Constructors' 17th Annual Air Show, Royal Aircraft Establishment, Farnborough.

Sept. 9-11—International Northwest Aviation Council, 20th annual convention, Boise, Idaho.

Sept. 10-14—American Society of Mechanical Engineers, Instruments & Regulators Div. Meeting, Detroit, Mich.

Sept. 16-22—American Society for Testing Materials, Second Pacific National Meeting and Apparatus Exhibit, Hotel Statler, Los Angeles.

Sept. 17—International Air Transport Association, 12th annual general meeting, Edinburgh, Scotland.

Sept. 17-21—Eleventh Annual Instrument-Automation Conference & Exhibit, sponsored by the Instrument Society of America, Coliseum, New York, N. Y.

Sept. 17-22—International Congress of Astronautics, sponsored by the International Astronautic Federation, Rome, Italy.

Sept. 23-26—American Society of Mechanical Engineers, Petroleum Conference, Hotel Statler, Dallas, Tex.

Sept. 24-28—1956 Trade Fair of the Atomic Industry, Navy Pier, Chicago.

Sept. 25-27—Annual Forum Conference, Morrison Hotel, Chicago.

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Vol. 65, No. 4

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Cherry Adds Aircraft Lockbolts to Fastener Line

Lockbolts for the aircraft industry have been added to the extensive line of aircraft fasteners produced by the Cherry Rivet Division of Townsend Company at its plant in Santa Ana, California.

Cherry Aircraft Lockbolts save weight, offer higher clinching action than rivets, more uniform clinch than bolts and nuts. Their use makes possible an effective seal and rigid joints with high shear and tension values. Fitting-up operations are simplified which helps increase production and results in a lower installed cost.

High production applications of the aircraft industry are especially adapted to the use of lockbolts since they combine the advantages of riveting and bolting —eliminate the disadvantages.

The Cherry Lockbolt line includes a complete range of diameters, grip lengths, and head styles which are designed and produced to meet specifications and requirements of the aircraft industry. They are available in alloy steel and aluminum alloy.

The addition of lockbolts to the Cherry line is further evidence of the continuing program at the Cherry Rivet Division which has as its objective the ultimate in fastening service to the aircraft industry. In fact, all the resources of the Santa Ana plant—experience—technical skill—special equipment—tremendous capacity —the facilities of its research and development department plus the services of its field engineers are devoted exclusively to providing better fastening methods for the aircraft industry.

For information on Cherry Lockbolts, write for new bulletin TCL-111 to Townsend Company, Cherry Rivet Division, P.O. Box 2157-N, Santa Ana, California.

Licensed under Huck patent nos. RE 22,792; 2,114,493; 2,527,307; 2,531,048; 2,531,049.

CHERRY RIVET DIVISION

SANTA ANA, CALIFORNIA

Townsend Company

ESTABLISHED 1816 • NEW BRIGHTON, PA.

This is the "flag" method — it and the horse and buggy have both served well.

CAI puts the helicopter on the right track!

announcing the

CAI BLADE TRACKER

The first successful remote reading helicopter blade tracker! On the ground or in the air, CAI's Electronic Blade Tracker automatically tracks the position of any blade in the plane of rotation relative to others in the same rotating assembly . . . does it with dependable accuracy and presents the measurement on a meter. The helicopter's safety factor is now increased . . . the problem of vibration greatly reduced. The compact and ruggedized Electronic Blade Tracker requires only one operator to track either main or tail rotors on the ground or in an airborne installation. The speed and accuracy of this method means important economies in tracking cost and maintenance.

CAI's in-flight blade tracking opens a whole new field in helicopter development and safety. Accurate tracking is now readily achieved under dynamic load and during cyclic pitch variations. Pilots can detect instabilities almost the instant they creep into performance. Mechanics can do a more accurate job of tracking in less time without chance of blade damage. Engineers can read out-of-track data continuously at any radial position of any blade.

The CAI Electronic Blade Tracker gives the engineer a research tool that can vitally affect the design of tomorrow's helicopter . . . perhaps help make tomorrow's helicopter—today's. From research through manufacture, the Blade Tracker is exclusively CAI—only one of a long list of scientific accomplishments.

CHICAGO AERIAL INDUSTRIES

1980 Hawthorne Avenue, Melrose Park, Illinois
Chicago office: 332 S. Michigan Avenue, Chicago 4, Illinois

optics electronics manufacturing

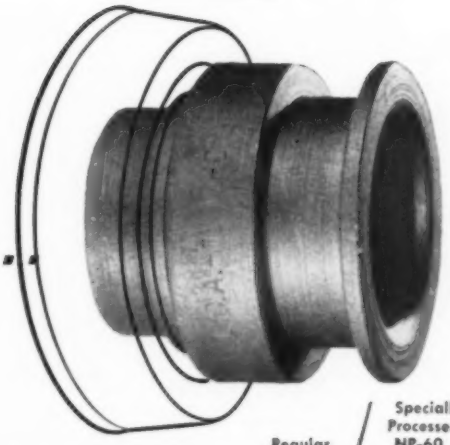
"SWITCH!" said Ostuco

. . . and savings were surprising!

Pleasant surprise, too! Bearings Company of America, Division of Federal-Mogul-Bower Bearings, Inc. Lancaster, Pa., was machining OSTUCO seamless tubing to make a clutch release bearing collar used as original and replacement equipment. Results were fine!

Then word came from OSTUCO, recommending a switch to OSTUCO's newly developed NP-60, tubing specially processed for machineability. Cost was slightly higher, but BCA and OSTUCO engineers predicted the savings would justify the change.

they switched . . .



and they SAVED!

	Regular	Specially Processed NP-60
Production per 8 hour shift (units)	675	840
Production time per 1000 units (hours) . . .	12.35	10.03
Total Labor per 1000 units (man-hours) . .	13.09	10.63

Besides the savings, Bearings Company of America was pleased with the better finish of the new part. They point out that the collar in photo above "shows the finish as it comes directly off the machine."

It happens this way often enough to warrant checking with OSTUCO about your tubing applications and production problems. Contact your nearest OSTUCO Sales Engineer or write direct to the Shelby factory —there's no obligation!

OSTUCO TUBING

SEAMLESS AND ELECTRIC RESISTANCE WELDED STEEL TUBING—Fabricating and Forging

OHIO SEAMLESS TUBE DIVISION
of Copperweld Steel Company • **SHELBY, OHIO**
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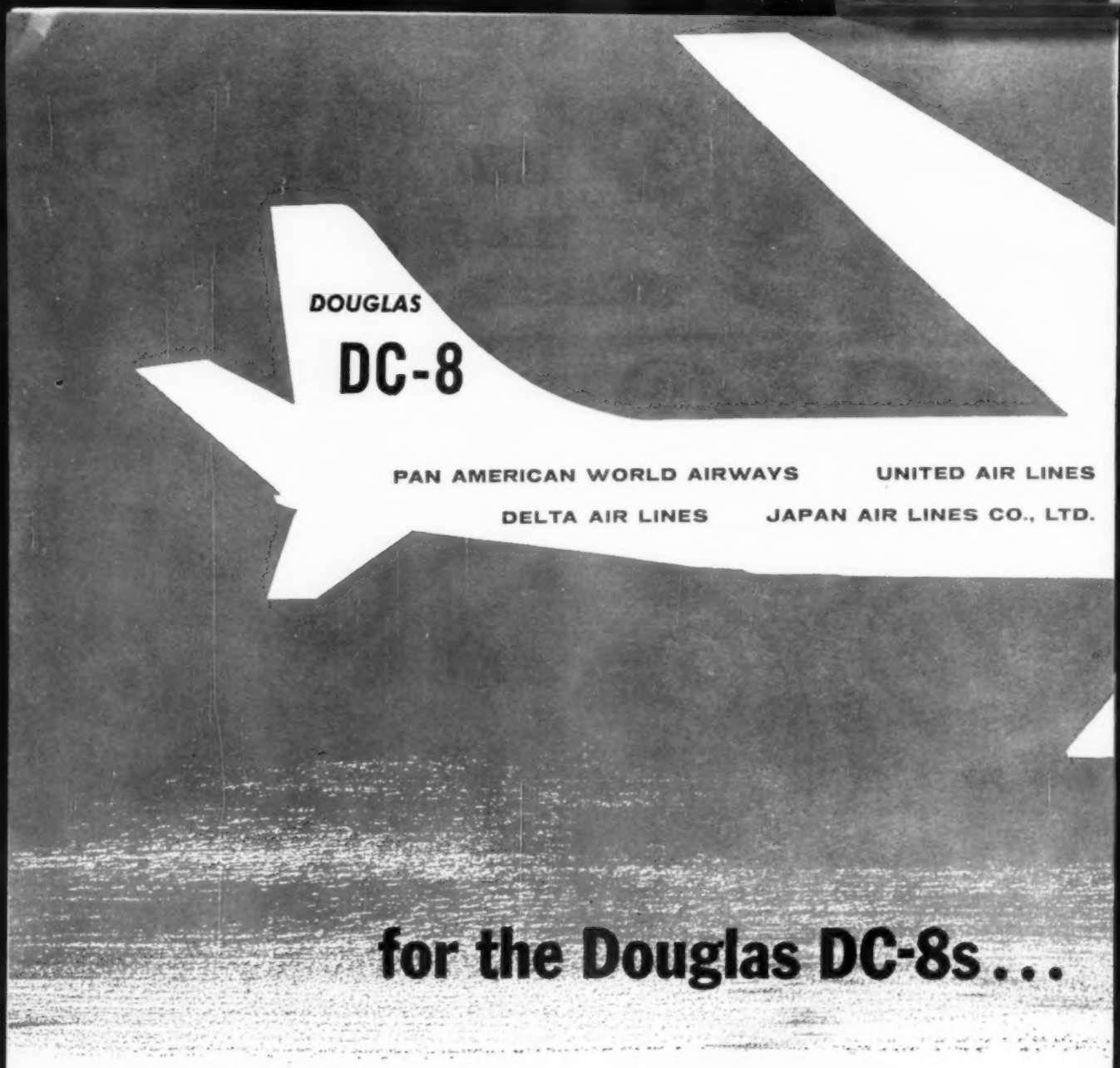


for the Douglas DC-8s . . .

When the new Douglas DC-8s are delivered to the major airlines, each plane will be equipped with a Sperry SP-30 Flight Control System – a precision system designed and engineered to meet the demanding requirements of multi-jet and turbo-prop aircraft.

Superior to all Previous Flight Control Systems

From Sperry's broad, unparalleled experience in equipping thousands of commercial and military aircraft with flight control systems, Sperry engineers designed the SP-30 especially for high-speed, long-range aircraft. Operational needs of tomorrow's new transports were anticipated throughout the system design.

Excellent Performance in All Flight Conditions

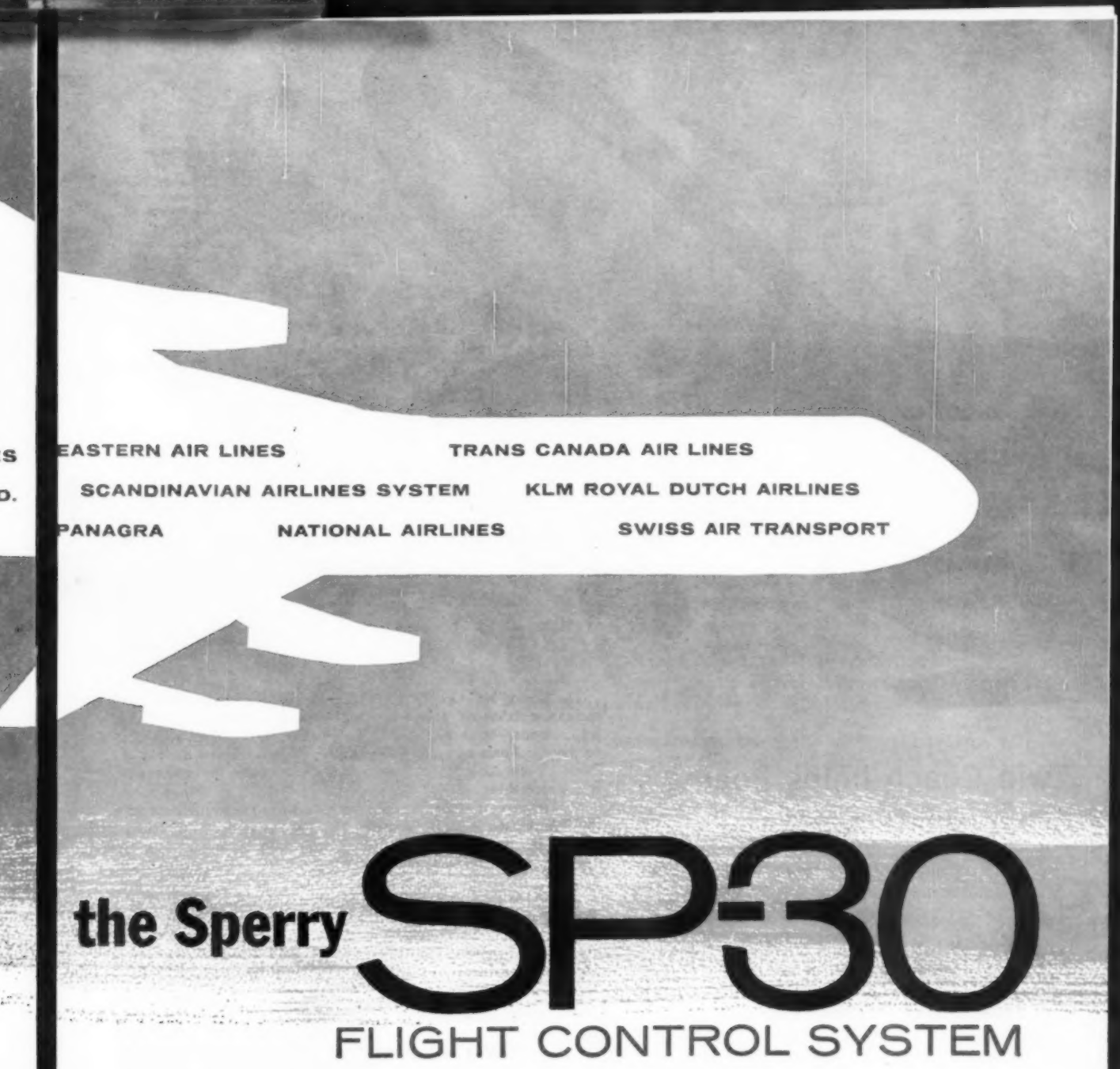
Precise automatic control of aircraft flying between landing and sonic speeds.

Accurate automatic navigation utilizing radio station facilities–but enabling pilot to monitor flight through integrated "pictorial" instruments.

Closer control in altitude, cruise and radio guidance modes.

Improved compass system gives accurate heading information even in polar regions.

Improvements in all-weather landing approach control.



the Sperry SP-30

FLIGHT CONTROL SYSTEM

SP-30 Design is Compact, Reliable

While all components are designed for maximum reliability, they are uniformly compact in size and minimum in weight. Among advanced techniques employed are redundant circuits, transistors and magnetic amplifiers which drive servo motors directly to assure an extremely reliable system. Plug-in components provide economy and ease of maintenance.

Sub-systems for each control axis (rudder, elevator and ailerons) are self-contained and also serve as damping devices to aid pilot during manual control. Monitors on each axis automatically guard against malfunctions.

Supported by World-Wide Field Service

Airlines specifying the SP-30 are assured of Sperry's continuous support through its experienced staff of field service engineers stationed at major terminals.

Write for the complete story of the advantages of the SP-30 system to our Aeronautical Equipment Division.

SPERRY GYROSCOPE COMPANY
Great Neck, New York
DIVISION OF SPERRY RAND CORPORATION
Cleveland • New Orleans • Los Angeles • Seattle • San Francisco
In Canada: Sperry Gyroscope Company of Canada, Ltd., Montreal, Quebec

Twin Coach Aircraft Division is a subcontractor for Boeing, Cessna, Grumman, Martin, North American, Republic and classified experimental aircraft types.

Twin Coach helps Boeing get them in the air

Sooner

The Boeing KC-135 jet tanker-transport is of vital importance to the national defense. The prototype of this airplane—America's first jet transport—is shown above. To produce and deliver KC-135s to the Air Force as rapidly as possible, Boeing enlisted the aid of Twin Coach Aircraft Division as a subcontractor for major airframe assemblies.

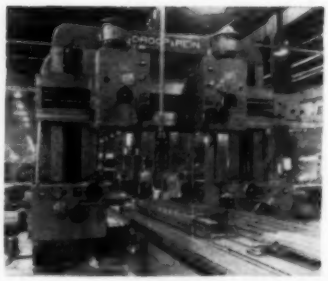
This important assignment typifies the way prime contractors rely on Twin Coach Aircraft Division. For Twin is staffed with experienced aircraft specialists to design and build tooling . . . with experienced aircraft production personnel . . . under experienced aircraft supervision and management.

If you have an assembly you're thinking of subcontracting, call Twin Coach Aircraft Division. You'll be secure in the knowledge that your assembly will be built by *aircraft* specialists—by men whose sole aim is to build to specification . . . on schedule . . . at the lowest possible cost.

AA-1431

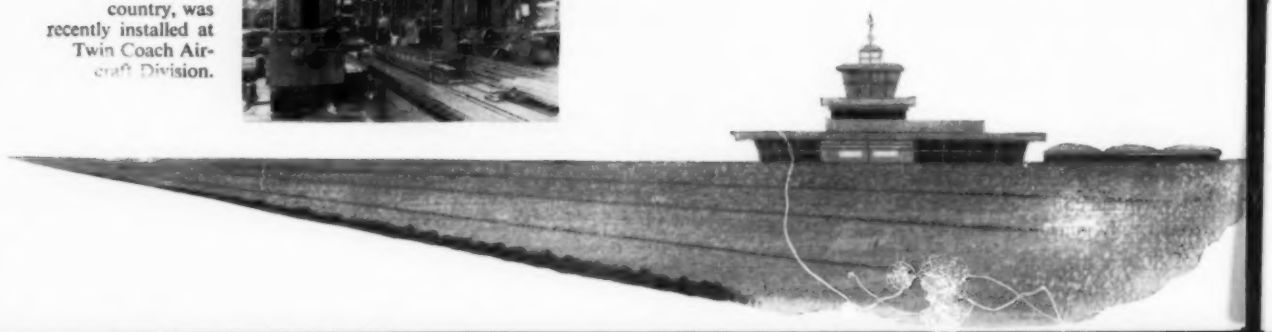
TWIN COACH COMPANY
Aircraft Division

BUFFALO, N. Y.



Giant 25-foot Droop & Rein universal planer mill, only one of its kind in the country, was recently installed at Twin Coach Aircraft Division.

Other divisions of Twin Coach Company make:
FAGEOL VAN AND PONY EXPRESS TRUCKS • FAGEOL GASOLINE AND PROPANE ENGINES • FAGEOL-LEYLAND DIESEL ENGINES.



Good Service is Good Business

The importance of service is perhaps better understood by airline operators than by any other group of businessmen. The phenomenal growth of the airline industry itself is based on a dynamic program of constantly striving for better and ever better service standards.

We, of the Scintilla Division of Bendix*, have over the years made every effort to aid the airlines in accomplishing this worthwhile achievement.

Service to us means: producing the finest and most modern ignition equipment that creative engineering and manufacturing skill can achieve, and, of equal importance, service means backing this equipment with a complete and efficient organization of trained service specialists whose every effort is given to insure that the customer receives full benefit of the quality and performance built into the equipment. Our extensive service organization has specialized in ignition equipment for over thirty years.

Airlines specifying Bendix jet ignition equipment have the definite assurance that jet service will in every respect match the excellent service we have given on piston engine equipment that has made Bendix—The Most Trusted Name In Ignition.

*Trademark

SCINTILLA DIVISION OF BENDIX AVIATION CORP., SIDNEY, N. Y.

Bendix produces complete ignition systems for jet engines; Bendix field service is the most complete in the industry.

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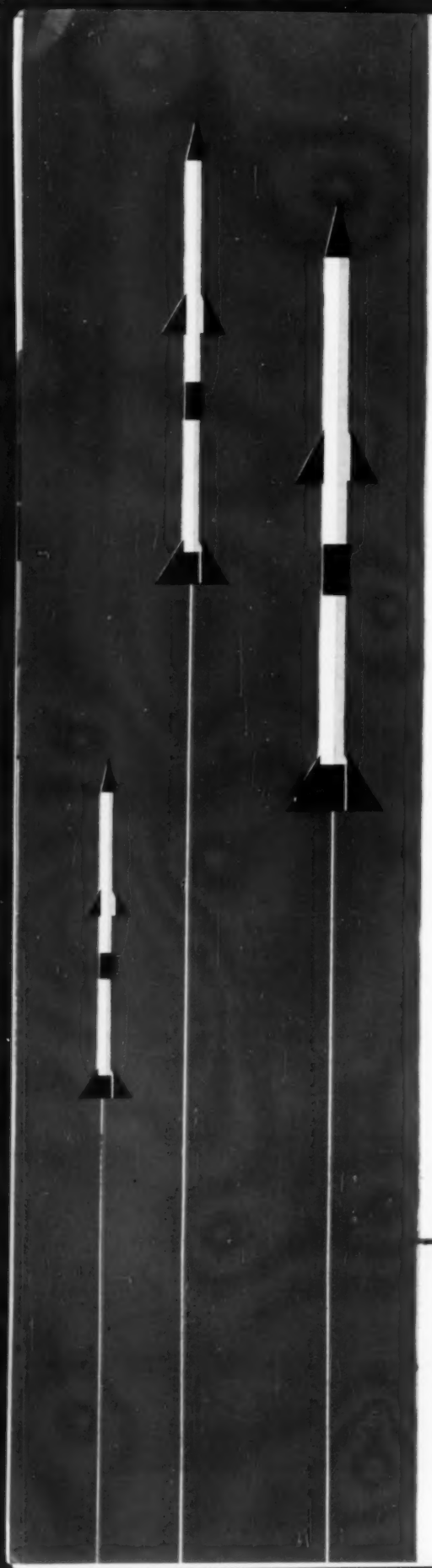

Computation... reputation... and the dynamics of defense

Whether to guide a missile, to detect an enemy, to navigate a plane or to sight a gun . . . modern defense systems depend on computation.

And computation is Burroughs' business. It is the basis of our worldwide reputation for outstanding high-speed business machines . . . and of our recognition in the advanced fields of electronics and magnetics.

Today, with the continual change in defense concepts, Burroughs' progressive experience and integrated facilities are of increased value. They enable us to accept the prime responsibility for Armed Forces projects—from analysis and research, through development, engineering and tooling . . . into production, testing, field service and training.

In the fields of instrumentation, control systems, communications, electronic computation and data processing, we have proved our abilities on some of the most far-reaching assignments. Please address inquiries to Burroughs Corporation, Detroit 32, Michigan.

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The Foremost Name in Computation

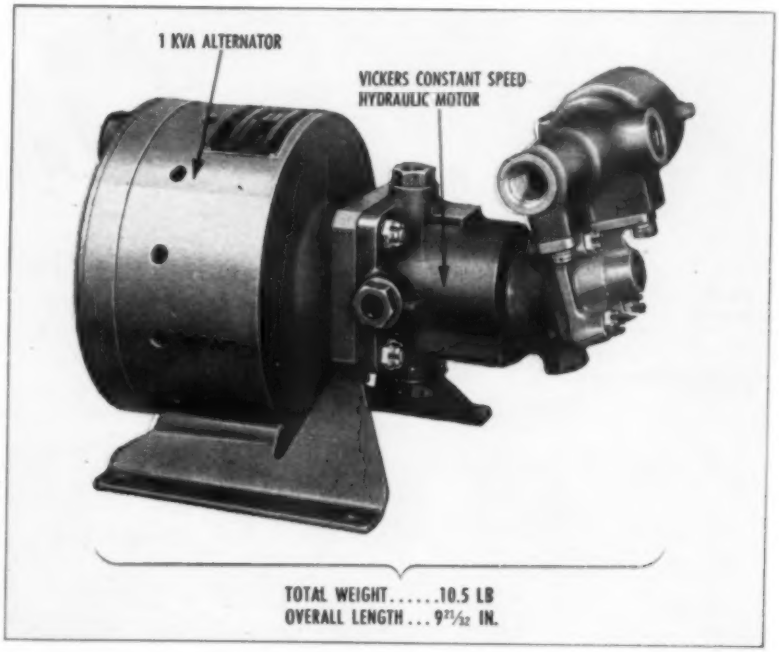
Looking to future expansion, Burroughs invites inquiries from qualified engineers.

New Vickers Airborne Electrical Power Package

. . . Saves Weight and Space

Utilizes the Hydraulic System for More Efficient Production of AC Power

This new isolated electrical power package provides closely regulated AC power with minimum weight and envelope while drawing its power from a hydraulic system. In new designs or when adding electronic equipment to aircraft designs in which the electrical system is already loaded to capacity, this versatile package provides the needed AC power from flow available in the hydraulic system. This generally is permissible without system change as the full flow is seldom demanded except for a few seconds under rare circumstances. Even in such cases, full flow can be guaranteed to these hydraulic functions through the use of a simple priority valve which starves the AC power package momentarily.



Less Weight and More Efficient

Important weight savings are achieved through the use of this package instead of an inverter which may also require an increase in the AC generator and line capacities. In one instance, the 10.5 lb 1 kva package replaced a 38 lb inverter for co-pilot instrumentation. An additional advantage is that the package has 62% overall efficiency while that of the inverter was 35-40%.

Extreme altitude operation is no problem as the Vickers isolated electrical power package contains no brushes or other altitude-sensitive components.

Features of AC Generator

The permanent magnet type AC generator has excellent life and reliability. It requires no bulky voltage regulator . . . is inherently smaller and lighter than conventional generators due to the elimination of the exciter and slip rings. It also has higher overall efficiency resulting from elimination of all excitation losses. Additional advantages are that the permanent magnet is unaffected by momentary short circuit, or separation of field and armature without keeper, or by temperature cycling. It is also not susceptible to aging or shock. This unit is 120/208 volt, three phase, wye connected with 400 cps at 8000 rpm. It is capable of continuous duty under environments of 0-55,000 feet altitude and ambient temperatures from −65 F to 250 F.

Hydraulic Motor Drive

The generator is directly driven by a Vickers Constant Speed Hydraulic Motor having fixed stroke and an integral flow control valve that maintains an 8000 rpm speed setting within ±2½% regardless of the load (as long as valve inlet pressure is greater than load requirement). For the unit shown above, maximum operating pressure is 3000 psi while rated output of 1 kva requires operating pressure of 2200 psi. Special configurations will maintain 400 cps frequency within ±0.1% regardless of load. This motor has a very high horsepower-weight ratio and its overall efficiency exceeds 92%. It is a time-proved design capable of many hundreds of hours of continuous service without attention.

Many Uses and Sizes

The applications for this isolated power source are numerous. For multi-engine aircraft, its use for co-pilot instruments provides dual reliability. This package has been used to supply controlled frequency AC power in emergencies when the only source of power in the airplane is a ram air turbine driven pump. The efficiency of this arrangement minimizes the size and weight of the ram air turbine necessary to provide emergency hydraulic and electric power.

Now available in the sizes listed below, larger packages can also be supplied from existing components. Vickers is prepared to develop the package best suited to a specific need. For further information, get in touch with your nearest Vickers Aircraft Application Engineer.

Vickers Airborne Electrical Power Packages

kva output	weight, pounds
0.5	7.0
1.0	10.5
1.5	12.5
2.0	15
2.5	17
3.0	19

Larger capacities with minimum weight are available.

VICKERS INCORPORATED
DIVISION OF SPERRY RAND CORPORATION
ADMINISTRATIVE and ENGINEERING CENTER
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Aircraft Application Engineering and Service Offices: El Segundo, California, 2160 E. Imperial Highway • Detroit 32, Michigan, 1400 Oakman Blvd. (Service Only) • Arlington, Texas, P. O. Box 213 • Washington 5, D.C., 624-7 Wyatt Bldg. Additional Service facilities at: Miami Springs, Florida, 641 De Soto Drive
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Engineers and Builders of Oil Hydraulic Equipment Since 1921

ATTENTION TO DETAIL *SPARKS* **TWA**

Ambassador

SERVICES

CUISINE BY INTERNATIONAL CHEFS

Gourmet dinners and the exciting "Intercontinental Canape" buffet, served with such a flourish aboard the luxurious Super-G Constellations of the TWA Ambassador services, don't just happen. Sandwich or filet mignon . . . fresh fruit or rare vintage wine, reach you at ideal texture and temperature because designer, engineer and manufacturer produced a highly efficient "airborne restaurant" in which to preserve, prepare, and serve such taste tempters. TWA chose carefully.

BENDIX FUEL AND IGNITION SYSTEMS BY PAC

Equal care was used in choosing Pacific Airmotive Corporation to supply Bendix fuel and ignition systems for TWA's fleet of 110 aircraft. W. F. Griffith, Director of Domestic Purchasing for TWA states: "We have found through experience that PAC can more than satisfy our exacting delivery requirements while substantially reducing our inventory investment and virtually eliminating parts shortages. Pacific Airmotive's "APS"* has proven its value by helping us make substantial savings, and thereby has contributed materially to TWA's extremely rapid progress during the past several years."

**APS — Advance Planning Service*

PAC

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7908

TOTE THAT BARGE... LIFT THAT LOAD!

Bell HSL helicopter tows 300-ton derrick barge at approximately 8 knots. Towing om on Bell HSL is raised and lowered by Western Gear drag boom hoist.

Kaman HOK-1 twin rotor helicopter with Western Gear hoist, shown here in simulated rescue trials.

Bell 47J helicopter uses Western Gear hoist for rescue operations. Bosun's chair or litter can be used.

Closeup of Western Gear hoist installation for Bell 47J helicopter showing compact, lightweight design.

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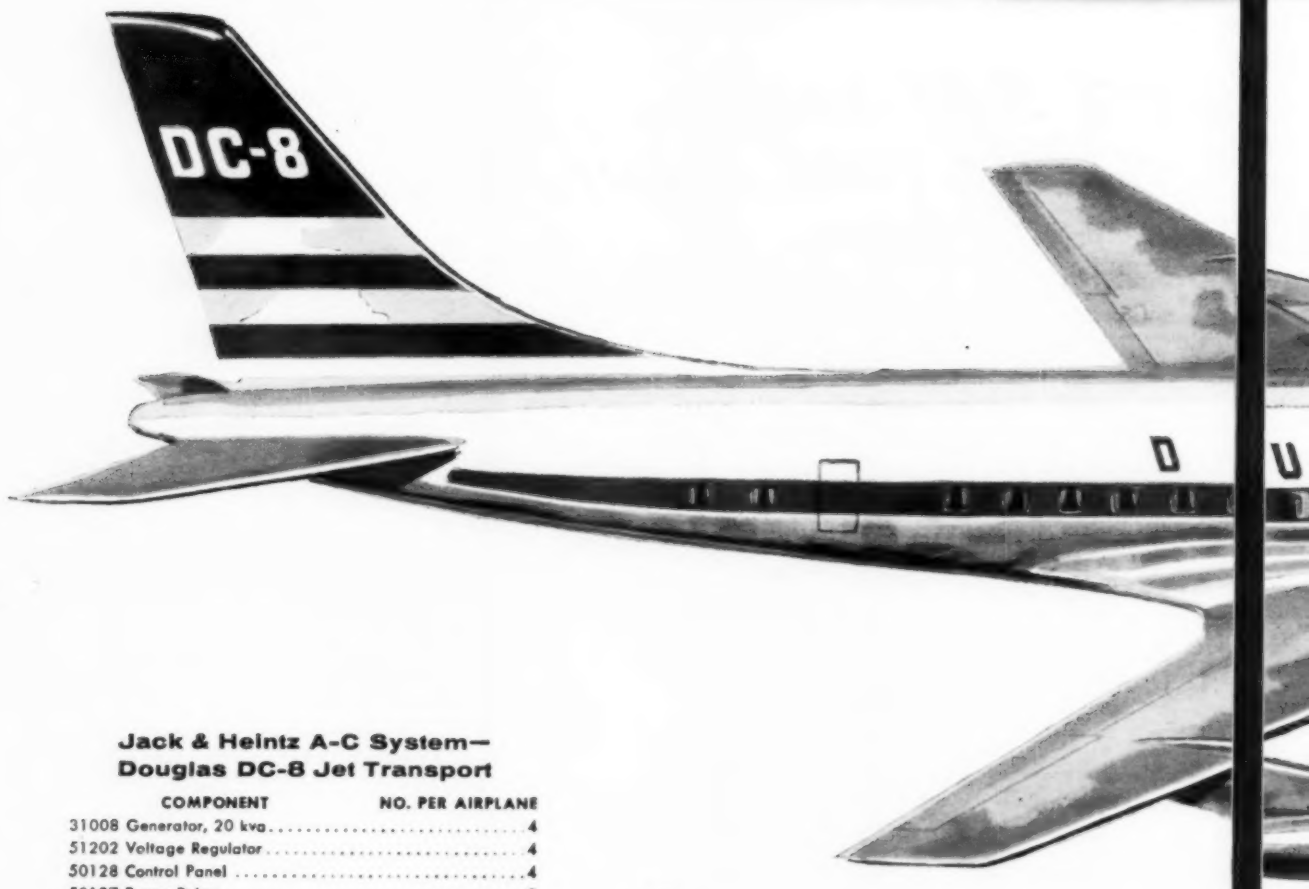

Jack & Heintz A-C System— Douglas DC-8 Jet Transport

COMPONENT	NO. PER AIRPLANE
31008 Generator, 20 kva	4
51202 Voltage Regulator	4
50128 Control Panel	4
50137 Power Relay	8
50162 Current Transformer & Limiter Panel	4
50130 Bus Protection Panel	1
50124 Current Transformer (separate mtg)	12

Total weight—all components—380 pounds.

Jack & Heintz engineers and Douglas equipment section engineers discuss a-c system design at Santa Monica, Calif. Left to right, are: M. H. Peairs, electrical systems engineer, DAC; Peter Duyan, chief equipment section, DAC; Sid Webster, western district manager, J&H; A. W. Rebard, DC-8 group engineer, DAC; and Robert Sumner, field service representative, J&H.

JACK & HEINTZ

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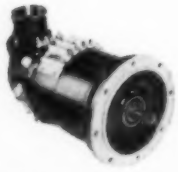
ELECTRIC EQUIPMENT



J&H Model 31193 Generator†

J&H Model 51202 Voltage Regulator

J&H Model 50128 Control Panel

J&H Model 50137 Power Relay

Generators: rated 20 kva; meet Military Class C thermal requirements; will deliver 137½% rated power continuously for DC-8 operating conditions.

Hi-Phase* Voltage Regulators: protect against overvoltage from asymmetrical faults; provide accurate regulation with static components; utilize printed wiring.

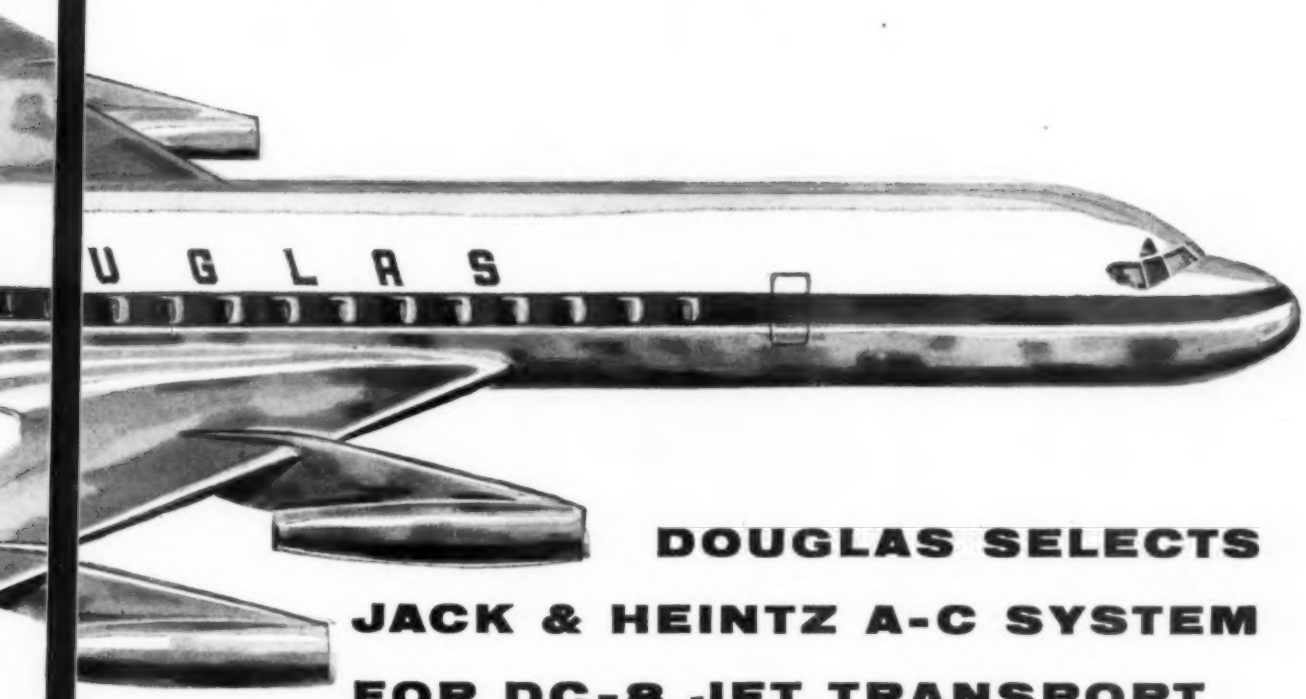
Control Panels: simple central wiring harness; unique overvoltage relays insensitive to acceleration and vibration.

Power Relays: feature mechanical phase isolation and easy maintenance.

Current Transformer & Limiter Panel and the Bus Protection Panel provide relaying, metering and load division functions.

†*Laboratory prototype for DC-8 system. This model is being superseded by J&H Model 31008 Generator.*

*T. M. applied for



DOUGLAS SELECTS JACK & HEINTZ A-C SYSTEM FOR DC-8 JET TRANSPORT

First A-C System Designed for Commercial Aviation

The a-c system designed by a team of Douglas and J&H engineers for the DC-8 is the first for a commercial airplane and incorporates in its design *tried and proved* principles in accordance with airline philosophy.

The ship-set components are simple in arrangement and automatic in operation.

Simplicity, Safety and Reliability are System Features

The system is as simple to operate as present d-c systems with all components readily accessible for easy maintenance.

The installation is designed so that the possibility of fault is remote. However, if a fault should occur, it is isolated quickly and automatically. Power to loads is interrupted only to those circuits affected.

Co-ordinated mechanical and electrical designs result in long reliable service life for components.

J&H Organization Proves Asset

Many factors were considered by Douglas in awarding the DC-8 a-c system contract. One primary factor in the selection of Jack & Heintz was its organization. Douglas considered it ideal for expeditious handling of an over-all system project. J&H conducts all research, development and production at *one* location, affording maximum engineering teamwork with minimum lost motion.

Important, too, is an intensive educational and maintenance support program which Jack & Heintz will offer the airlines to acquaint them with this new a-c system.

Whether your system problem is a-c or d-c, Jack & Heintz has the engineering know-how and complete facilities to meet your needs. Write Jack & Heintz, Inc., 17635 Broadway, Cleveland 1, Ohio. Export Department: 13 E. 40th Street, New York 16, N. Y.

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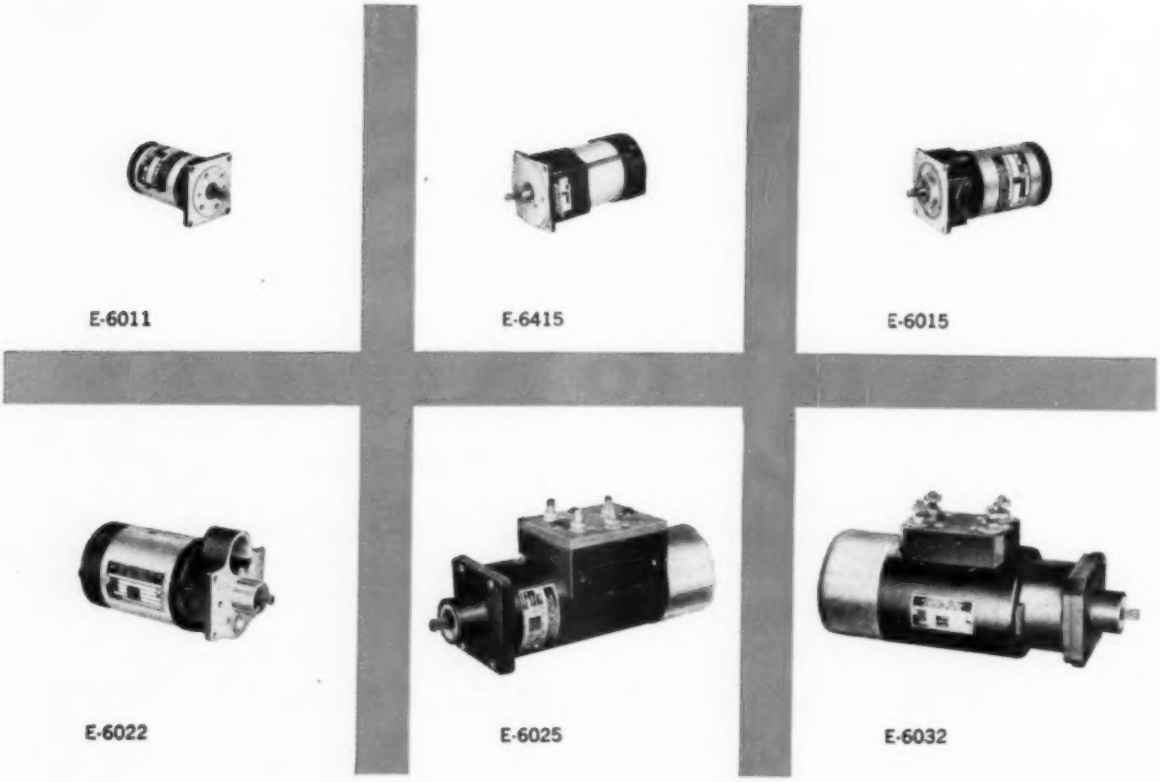

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Make Airborne your headquarters for aircraft electric motors. Our stock line will meet practically all your normal requirements, and if you should need a special motor, remember we have the staff and facilities to design and produce it for you quickly.

Model	Weight	Voltage	Int. Duty Rating
E-6011	4.1 oz.	26 v dc	.008 hp at 11,000 rpm
E-6015	12.0 oz.	26 v dc	.029 hp at 14,500 rpm
E-6415	12.6 oz.	400 cycle ac	.04 hp at 10,500 rpm
E-6022	2 lb., 1 oz.	26 v dc	.22 hp at 10,000 rpm
*E-6422	1 lb., 14 oz.	400 cycle ac	.15 hp at 9,250 rpm
E-6025	5.4 lb.	26 v dc	.75 hp at 9000 rpm
E-6032	8.25 lb.	26 v dc	1.5 hp at 6750 rpm
*E-6440	8.0 lb	200 v 3ϕ ac 400 cycle	2.0 hp at 11,250 rpm

*Not Illustrated

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JULY 23, 1956

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COVER: Sabena Belgian World Airlines was first carrier to place Convair Metropolitan 440's into operation on the European continent. Three 440's now operate on schedules from Brussels to Paris and London. Sabena has 9 more on order and is getting one every two weeks. Service will be expanded to Amsterdam, Copenhagen, Stockholm, Frankfort, Majorca and Geneva.

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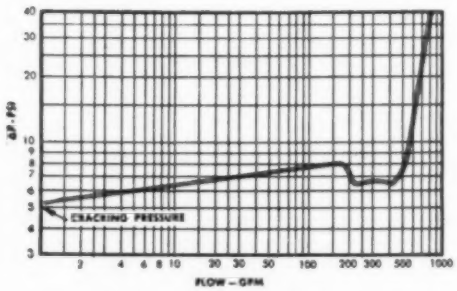

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EDITORIAL

Twining vs. Wilson on Russia

Gen. Nathan F. Twining, Air Force chief of staff, has made a frank, detailed and useful report to the Congress and the American people on what he and his staff learned about Soviet airpower during their recent visit to Russia. Even the security-screened version of this report does a better job of putting the competitive problem of U.S. and Soviet airpower into perspective than any other official statement we have seen.

The detailed report of Gen. Twining was made doubly necessary by the recent political maneuvering at Gettysburg that made him appear to have seen nothing more significant of Soviet airpower than glider stunts and women aerobatic pilots. Gen. Twining now has left no room for doubt that he and his staff were reinforced in their earlier judgment that the Soviets are putting a massive effort into building modern atomic airpower. He makes it clear that the Soviets will succeed in attaining the world superiority they seek unless the U.S. airpower effort expands its scope and accelerates its pace.

Perhaps the most significant revelation made by Gen. Twining was his first-hand evidence of Russia's refueling capability. AVIATION WEEK predicted that the Russians would reveal this capability at Tushino air show time (AW May 14, p. 25), but we certainly did not anticipate the casual manner in which they confirmed its existence through the hose-linked Badgers on the ground at Kubinka airdrome. Gen. Twining also quoted Soviet air force generals as discussing two other methods of aerial refueling under development.

This explodes another one of the myths about Russian airpower carefully fostered by Defense Secretary Charles E. Wilson. Until Gen. Twining's revelation, Mr. Wilson has been finding great comfort in our large fleet of B-47 medium bombers whose range can be extended by aerial refueling from the lumbering, low-altitude piston engine KC-97 tanker fleet. Mr. Wilson has been loud in his statements that there was no evidence of a Russian aerial tanker fleet. Without a tanker fleet, Mr. Wilson was fond of telling Congress, the Soviets could not match the offensive range of the B-47 fleet refueled by KC-97s.

The existence of Russian aerial refueling capability without the appearance of a tanker fleet is made clear by the hose-linked Badgers at Kubinka. The Russians have apparently adopted the "buddy system" of refueling proposed several years ago by the Air Force and now used by carrier-based Navy planes. This system makes all aircraft quickly convertible into tankers and provides a much greater degree of operational flexibility at far less cost than the tanker fleet concept.

Some USAF strategists still believe it would have been far better to modify the B-47 and B-52 for quick conversion in the field into tankers, with performance comparable to the bomber recipients, than to make the vast investment already ploughed into the KC-97 fleet and now programmed for 400 KC-135 jet tankers.

The Soviet Bear turboprop bomber has intercontinental range without refueling. The four jet Bison, although smaller than the B-52, probably can achieve greater operational flexibility for both medium and long-range missions by using the "buddy system" of aerial refueling. The twin-jet Badger, although smaller than the B-47, also can operate over longer ranges than the B-47 because it can refuel from other "buddy" Badgers at its best operational speed and altitude. The B-47, on the other hand, consumes enormous quantities of fuel coming down to the altitude and speed of the KC-97.

Mr. Wilson's budget defense on the grounds that the Russians have no aerial refueling capability has proved to be another of his subjective dreams quickly dissipated.

The march of events over the past three years, and particularly the facts accumulated during Gen. Twining's visit to Russia, have punctured almost all of Mr. Wilson's imaginary concepts of Soviet airpower with which he was once fond of regaling the American people and Congress.

Mr. Wilson's 1954 confidence that the Russians were building primarily a defensive air force was blasted by the roar of twin-jet Badgers, four-jet Bisons and turboprop intercontinental Bear bombers in 1955.

Mr. Wilson's brushing off of new Soviet jet fighters and bombers as "hand-built prototypes" was refuted by the squadron-sized formations of Badgers, Farmers, Flashlights and Frescoes flown publicly on May Day and at Tushino in 1955.

Mr. Wilson's dismissal of the Soviet development effort as a flash in the pan concentration on only a few types was thoroughly disproved by the new crop of planes revealed in 1955-56, running the gamut from huge twin-engine helicopters, jet assault transports, jet airliners, supersonic day and all-weather fighters and the big jet and turboprop bombers.

Mr. Wilson's claim that new Russian aircraft were only imitations of western designs was given the lie by Pavel Sukhoi's new delta designs, the supersonic light bomber (a type that doesn't yet exist in the West) and the new Yakovlev supersonic all-weather fighter embodying an approach quite different from anything on this side of the Atlantic.

Gen. Twining specifically noted evidence that Russian aeronautical designers "are now pioneering on their own in the field of modern aircraft development."

Gen. Twining labeled Blowlamp, the new supersonic light bomber prototype, as the most significant aircraft his party saw; however, other western technical observers found additional significance in the appearance of the 1,200 mph. Super Farmer (MiG-21) only 18 months after the 900 mph. Farmer (MiG-19) first flashed into public view, and the similar quick improvement of Soviet all-weather fighters from the Yak-25 Flashlight to the Super-Flashlight in the same period.

Glimpses of advanced delta designs in Mach 3 wind tunnels and the overwhelming evidence that the Soviets are pushing their atomic-airpower development on a top priority urgency and drafting their best people into this technical surge are also indelible impressions left with Gen. Twining's party. The visit to the Zhukovsky air engineering academy and the air force academy at Monino left little doubt of the heavy emphasis the Soviets are placing on thorough aeronautical training.

Gen. Twining's detailed report should be studied carefully. As the cold, factual appraisal of a professional airman, it deserves much more serious consideration by the American people in planning their future than the inaccurate and careless generalities dispensed by Defense Secretary Wilson.

—Robert Hotz

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WHO'S WHERE

In the Front Office

Capt. Charles T. de Navarra, vice president-technical advisor, Cubana de Aviacion, replacing **Capt. D. F. Robbins,** who returned to Pan American World Airways.

E. D. Wilgus, vice president-general manager, Aviation Developments, Inc., Burbank, Calif.

James D. Kingery, assistant to executive vice president, Bell & Howell Co., Chicago, Ill. Also: **Stuart C. Plettner,** manager, Government Products Selection; **Carl J. Stauff,** director-government sales; **Robert A. Hanson,** government contracts administrator.

Wiley R. Wright, chief of staff of newly established Industry and Interagency Liaison Staff, Office of Aviation Safety, Civil Aeronautics Administration, Washington, D. C.

Phillip S. Fogg, board chairman, Consolidated Electrodynamics Corp., Pasadena, Calif. **Hugh F. Colvin** succeeds Fogg as president.

Maj. Gen. Edward M. Powers, (USAF, ret.), joined the board of directors, Flight Refueling, Inc., Baltimore, Md.

Col. C. Glen Williamson, (USAF, ret.), an associate, Sherman Fairchild & Associates, Inc., New York, N. Y.

William A. W. Krebs, Jr., vice president, Arthur D. Little, Inc., Cambridge, Mass.

A. H. Hird, special director, Vickers, Ltd., and **Joseph B. Wharton, Jr.,** and **Richard Hodgson,** to the board of Fairchild Camera & Instrument Corp., Syosset, N. Y.

Victor L. Schrager, a director, Navigation Devices, Inc., Binghamton, N. Y.

A. Bruce Boehm, executive vice president, Enjay Co., Inc., New York, N. Y.

Honors and Elections

George F. Smith, North American Aviation test pilot, who made a successful supersonic emergency bailout from an F-100 Feb. 26, 1955, received Flying Tiger Trophy from American Volunteer Group. Other award recipients: **Lt. Russell Brown,** winner of the first jet-to-jet aerial combat in Korea in 1950 and **William Bridgeman,** Douglas test pilot.

Capt. P. V. H. Weems, USN (ret.), received the Institute of Navigation's Thurlow Award.

Victor E. Carbonara, president-general manager, Kollsman Instrument Corp., is in charge of aviation industry's participation in the 1956 Sister Elizabeth Kenny Foundation's fund raising campaign.

Changes

M. M. Miller, chief of a new and separate acoustics section, Douglas Aircraft Co., Inc., Santa Monica, Calif.

J. C. Sullivan, chief traffic officer, Canadian Air Transport Board, Ottawa, Ont.

King D. Bird, assistant chief, wind tunnel department, Cornell Aeronautical Laboratory, Buffalo, N. Y.

William K. Lawton, executive director-secretary, National Business Aircraft Assn., replacing **Jean DuBuque,** resigned effective July 31.

(Continued on page 61)

INDUSTRY OBSERVER

► **Air Force and Navy have standardized on a new common data link system. Its development will begin within the near future. The Air Force is now using data link developed by General Electric under the sponsorship of the Rome Air Development Center. The Navy has been developing its own system at Bell Telephone Laboratories.**

► First firings of the WS-315A, the Douglas Thor intermediate-range ballistic missile, are expected before the end of 1957.

► **Navy is returning the USAF's interest in the Navy Talos anti-aircraft missile by investigating the Martin Matador TM-61 tactical missile for possible use by the Marine Corps. Navy interest in the Matador is currently very high.**

► Convair and Grumman have new seaplane projects undergoing tests in the tow tank at Stevens Institute, Hoboken, N. J. The tow tank was used by Martin in the testing of the P6M SeaMaster and its beaching gear.

► **Goodyear Aircraft Corp. has been commissioned to design pneumatic helicopter rotor blades under a $46,946 Navy Bureau of Aeronautics contract. The blades, an outgrowth of Goodyear's inflatable airplane (AW Feb. 13, p. 39), will be tested at Patuxent River on Goodyear's GA-400R one-man helicopter.**

► Construcciones Aeronauticas of Madrid has signed a production contract with Heinkel for the production of the C. H.-101, a lightweight supersonic delta-wing fighter. The aircraft is scheduled to be powered by a Bristol Orpheus turbojet engine.

► **North American Aviation, Inc., has received a $7,485,408 Navy contract for the modernization of FJ-3 fighters. Present models of the FJ-3 have a speed of 530 kts., an operating ceiling of 45,000 ft. and a combat radius of 300 nautical mi.**

► Boeing Airplane Co. has received a $207,346 Air Materiel Command contract for extension of the KC-135 jet tanker flight test program.

► **National Advisory Committee for Aeronautics, Langley Field, Va., will open bids on Wednesday prior to letting a contract for the production of pilotless aircraft airframes requiring precision machining and welding techniques for magnesium, aluminum and some steel. Most of the work under the contract will be on prototype airframes.**

► Vickers-Supermarine order for N. 113 twin-jet fighter developed for the Royal Navy totals 100 aircraft. Aircraft is powered by a pair of Rolls-Royce Avons.

► **Defense Department's reorganized Weapon Systems Evaluation Group (AW May 21, p. 29) has been given the name of Institute for Defense Analyses.**

► Flyaway cost of the Douglas A3D2 Navy attack plane is $1,875,657. Unit support and spares cost an additional $840,446.

► **Northrop Aircraft's supersonic trainer will incorporate a number of features of the company's Fang mockup, including hinged sections and probably a low-aspect-ratio wing of delta shape. It also will have a horizontal stabilizer similar to the Fang's. The aircraft, which will weigh approximately 15,000 lb., will have its power plant buried in the fuselage rather than hung from underneath as in the Fang.**

► USAF's Air Materiel Command European Area is working with North Atlantic Treaty Organization nations to establish proper standards for recapping aircraft tires. USAF uses no recaps, but most other NATO nations do.

YEARS AHEAD

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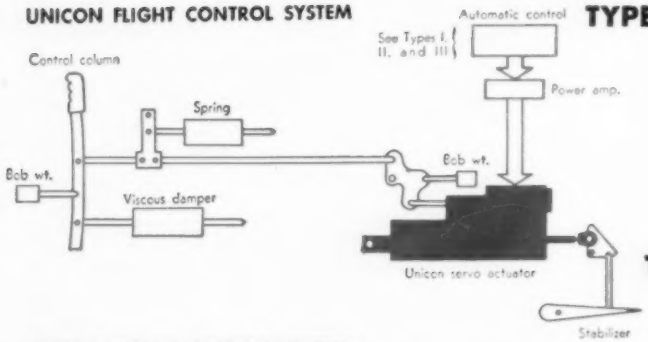


TYPE I

Integrates FLIGHT STABILIZATION and MANUAL CONTROL.

UNICON I — Integrated hydraulic servo actuator links in series the automatic flight stabilization and pilot manual input signals.

Fail-safe provisions include pilot override by stroke limiting the authority of the stabilization system. Optional pilot shut-off is also provided.

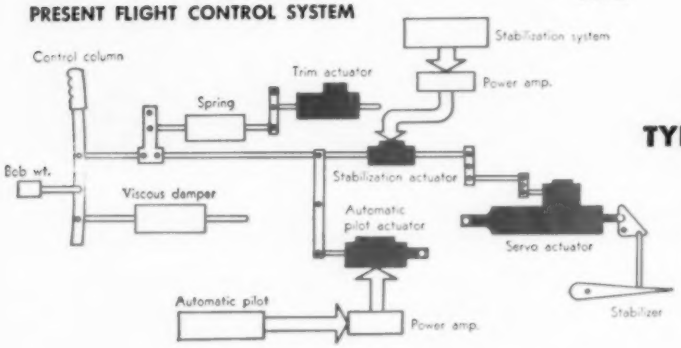
TYPE II

Integrates AUTOPILOT and MANUAL CONTROL.

UNICON II — Integrated hydraulic servo actuator links in parallel the autopilot and manual pilot input signals.

Optional pilot shut-off and autopilot force limited override provides fail-safe system operation.

PRESENT FLIGHT CONTROL SYSTEM



TYPE III

Integrates both FLIGHT STABILIZATION and AUTOPILOT CONTROL with MANUAL CONTROL.

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WASHINGTON ROUNDUP

Thermo-Nuclear Rockets?

Japanese reports of a series of fusion bomb explosions in the Eniwetok Proving Ground of the Atomic Energy Commission indicate rockets are being used to test thermo-nuclear missile warheads at altitudes up to 200,000 ft. Japanese scientists who monitor radiation from the Eniwetok blasts report that new explosions since the B-52 air-dropped bomb (AW June 25, p. 29) have been at increasing altitudes with the latest ten days ago apparently detonated above a 20-mile altitude. Meanwhile, the British are working feverishly to turn Christmas Island in the mid-Pacific into a hydrogen bomb testing site. Prime Minister Anthony Eden recently told Parliament the Christmas Island tests would all be high air bursts that produce little radio-active fall-out. This indicates Britain will use Christmas Island for testing the thermo-nuclear warheads for its intermediate-range ballistic missile.

Russian Invitation Doubtful

Russian air force chiefs probably won't get an invitation to the National Aircraft Show to match U.S. Air Force Chief of Staff General Nathan F. Twining's invitation to visit Moscow for the Russian air show on June 24. The Air Foundation, which will put on the U.S. air show in Oklahoma City on Labor Day, will discuss the subject at a Seattle meeting late this month, but the Russians will not be invited without full government cooperation. The hitch is that the Defense and State Departments regard the annual display as a private venture and not something to which they normally would extend an official invitation.

The Society of British Aircraft Constructors, acting on a request from the British Government, already has agreed to issue a limited number of invitations to the Russians for the annual Farnborough air show in September. As usual, military attaches in Washington will be welcome at the U.S. show in Oklahoma City over the Labor Day weekend.

Navy Dispersal

Watch for the Navy to take new notice of what a nuclear war can do by dispersing its forces along the Atlantic Coast. Studies are under way that may result in some shifting of home ports, more rotation of ships and longer periods at sea. One possibility is that new facilities will be built to home-port part of the fleet in the British West Indies.

'Revolt' Aftermath

Pentagon has made no announcements, but the "revolt of the Army Colonels" in May has resulted in some changes in the office of the co-ordination group under the Chief of Staff. Following the outbreak that forced Defense Secretary Wilson to hold an extraordinary press conference with his Chiefs of Staff to demonstrate service solidarity (AW May 28, p. 26), there was an internal explosion in the Army. Brig. Gen. L. C. Metheny, chief of the group, has asked for retirement. Col. D. P. Yeuell and Col. A. L. Wermuth have been moved to new assignments. Col. E. A. Chapman, deputy chief of the group, has new orders and will vacate his desk soon.

Gen. Maxwell D. Taylor, Army Chief of Staff, was genuinely shocked by the release of Army staff studies critical of Air Force planning to a small group of newsmen. Possibly even more furious was Maj. Gen. G. S. Meloy Jr., Army chief of public information, who had to face dozens of unfavored and indignant reporters when the week-end story broke. Third embarrassed officer was Lt. Gen. J. M. Gavin, chief of research and development, who originally had stimulated formation of the co-ordination group. At first, there was serious thought of wiping out the organization entirely, but Gavin argued for its survival with a new staff, and won.

How Much Is A Pound?

The Aircraft Industries Assn., after correcting current cost figures to make dollars worth what they were during World War II, reports that today's complex aircraft cost less pound for pound than the relatively simple models of 10 years ago. While the actual price of an F-100 is many times more than that of its F-51 ancestor, manufacturing techniques have improved to permit production of more airframe pounds per manhour than during the war. Complexity, labor, material costs and inflation are primarily responsible for the high prices of 1956.

Procurement Strings Eased

USAF contractors may be easing up on their criticism of procurement regulations and watch-dog clauses they have attacked in the past as interference with private enterprise. The Air Force has altered some of its language to meet aircraft industry objections but is still trying to retain a system of checks where they are really needed.

Newest placatory move came from the Defense Department, which has revised its directive of last December on payments to manufacturers with incentive and price-redetermination type contracts. In the latter case, a company may now offer a letter stating that the price is fixed, rather than quarterly statements on costs incurred. The former situation came about when the Department of Defense acted to prevent heavy overpayments that resulted in having contractors heavily in debt to the government. Loud industry complaints resulted from companies that resented additional paper work and feared bottlenecks in future contract negotiations.

Jet Operations Conference

The scheduled airlines have begun a series of conferences with Air Force technicians in an effort to draw on military turbojet experience in planning the entry of civil aviation into the jet era in 1959. The series started with a meeting on general problems involved in the operation of turbojets held last month at Wright-Patterson Air Force Base and will continue with detailed discussions on more specific problems.

Last week, representatives of individual airlines, the Air Transport Association, the Civil Aeronautics Administration and the Air Force met in Washington and discussed maintenance and ground handling problems. Particularly interesting to the airlines were Air Force views on operation of jet-engine test cells, use of blast fences and methods of keeping pavement on taxiways and run-up areas clear of refuse that could damage turbojet engines. Next meeting will be on engine maintenance and overhaul.

—Washington staff

Industry Battles Technical-Data Controls

Major trade groups insist technical data must be retained, Defense fears "bondage" to contractors

By Claude Witze

Washington—Climaxing two years of legalistic give-and-take, the Department of Defense and its major contractors last week were deadlocked over the issue of government control of technical data.

A proposed revision of the Armed Services Procurement Regulation Part 2, Section IX, covering data and copyrights, has been rejected by all major trade groups including the Aircraft Industries Assn. Their comments and suggestions, among the firmest and most provocative ever offered on a proposed ASPR revision, are being studied by the Pentagon's top procurement command.

The basic issue was described to AVIATION WEEK by a government attorney as a "contest over method." The attorney said the Administration now must decide "whether our approach is all wrong or all right."

The question, he said, is simple: Will defense contracts be awarded through advertising and competitive negotiation—which require the government to have technical data—or through negotiation with a single source?

The Defense Department feels the latter method is impossible because Congress insists upon advertised procurement in most cases. It also is convinced that, without such details as manufacturing drawings prepared by the contractor who developed the item, the government "will be in bondage" to the manufacturers.

Final decision on what the Defense Department will try to do about the deadlock will come from the office of Thomas P. Pike, assistant secretary of defense for supply and logistics.

Industry Viewpoint

Industry's viewpoint was presented a month ago in a 3,000-word statement calling for abandonment of the proposed regulation as a "disservice to the country, to the government and to industry." In addition to AIA, the statement was signed by the American Patent Law Assn., the Automobile Manufacturers Assn., the National Association of Manufacturers, the National Security Industrial Assn. and the Radio-Electronics-Television Manufacturers Assn. (RETMA).

A separate memorandum of protest was filed by the Machinery and Allied Products Institute and Council for Technological Advancement.

The document that stirred up this hornet's nest was circulated as a proposed regulation early in April. Requirements it would impose on defense contractors include:

- **All data necessary** to fully disclose and make understandable the results of research and development work must be given to the government.
- **Manufacturing drawings** of equipment ready for production or of a practical process developed on a research-and-development contract must be given to the government.
- **No limitation is placed** on the government's right to use the data except that which stems from the copyright or patent laws or was stipulated in the contract. Even in the case of patent coverage, Defense Department holds it cannot be enjoined from reproducing an article, product or process. The patent owner in such cases can resort to the Court of Claims.

Industry Objectives

The trade associations, in the first united front presented to the Defense Department by the six major organizations, relied upon the aircraft industry to illustrate just what happens when the government reproduces and misuses technical data.

In the 1920's, the statement said, the aircraft industry was almost destroyed because design contractors were not protected. Often, at great expense, they would design an aircraft or component and build one or two experimental models. When procurement bidding began, the data was given to competitors who then bid against the developing manufacturer. Since the developer sought to amortize the design costs in his price, the competitor (who had no design cost) usually won the contract.

As far back as 1926, Congress took action by providing compensation for the designer in the aviation industry. From that point on, it was common for the designer to win production orders for his own development.

Basic industry objections to the proposed new ASPR Part 2 include:

- **Research and development work** by private enterprise would be stifled. Data demanded by the Defense Department could be used in any way regardless of whether it was paid for under the contract. This would remove the incentive to invest in research facilities or personnel, a trend contrary to professed Defense Department policy.
- **Contractor's commercial rights** would be lost or impaired. "Background or built-in know-how" could be passed on, destroying the competitive position of the contractor. This would hurt the contractor, but it would not benefit the government.
- **Regulation is in conflict** with Bilateral Technical Interchange Agreements. These provide that data will be given to allied countries only through commercial arrangements.
- **Potential loss of foreign** patent rights. There is no protection for the contractor if the government chooses to give his technical data to a foreign national. This could prevent the contractor from obtaining valid foreign patents.
- **Administration of the regulation** will be adverse to the contractor's interest. The government's powerful bargaining position can be exerted to force the contractor to accept the unlimited rights clause for all kinds of data. It puts a special penalty on producers of defense products, would hamper their appetite to invest private capital in government work.
- **Manufacturing data is not** for sale as part of a production contract. If the government desires information for procurement or manufacturing purposes, it should get it under a separate contract.

Technical Data Arguments

In this last case of technical data connected with a production contract, the Department of Defense argues that it is needed for inspection, quality control, cataloguing, operation, mainte-

Proprietary Information

Washington—U. S. aircraft industry's traditional and common use of the term "proprietary information" is under heavy attack at the Pentagon.

Defense Department lawyers, facing a showdown in their fight for "rightful possession" of technical data, say that proprietary information is a fancy name for "trade secret," and has come to include technical information.

They say the term should be avoided, along with "proprietary item." Use of these terms in contracts, the lawyers fear, can lead to all kinds of difficulties and legal problems.

Arguments can result over what is or is not proprietary, partly because the government cannot be bound by what the contractor claims. In addition, there can be "unauthorized mental transfer of information" that is difficult to prove in a breach of contract suit.

nance, spares provisioning, storage and transportation. In the case of aircraft operating in a distant war theater, it may be necessary to manufacture parts on the scene.

Pentagon lawyers say the new ASPR draft is simply a codification of existing practice and policy. They say most of what is new was put there to protect the contractors and that the objections result from the fact that the policies are bluntly stated.

For industry, the six trade associations hold that data is a property and should not be mixed up in procurement with patents and copyrights. They say its transfer to the government should be on terms that consider the use to which it will be put.

In this connection, industry sees no objection to giving operational data to the government free of charge. But if the information is needed to permit production by a second or more sources, then industry wants to be paid. The amount should be a fair value, they say, based on what it costs and what the contractor will eventually lose by handing it over.

Contractor-to-contractor negotiation is favored for securing goods from a second source, the statement says.

The industry protest reflects to a great degree the approach of Robert E. Beach, counsel of United Aircraft Corp. and chairman of the NSIA Contract Negotiations Committee, who has been a leader in the fight for a fair ASPR approach (AW Nov. 7, 1955, p. 21).

Military Commands Reorganized To Pave Way for Manpower Cuts

Washington – Sudden reorganization of U.S. military commands in the Far East, Europe, Alaska and the Northeast was announced by the Defense Department last week as top-level decisions on future aircraft expenditures and armed force levels were awaited from the Eisenhower Administration.

The shakeup was viewed as a preliminary to an inevitable cut in military personnel with increasing reliance upon nuclear weapons and their delivery as a deterrent to war. Apparently without prior notification to working-level officers of the Army, Navy or Air Force, the Defense Department announced these changes:

- **Pacific and Far East Command** headquarters will be consolidated at Hawaii beginning July 1, 1957. Headquarters United Nations Command will be moved from Tokyo to Korea and U.S. support functions shifted from Army to Navy jurisdiction.
- **Northeast Command Headquarters** will be abolished Sept. 1, 1956. Continental Air Defense Command will take over air defense responsibility in that area.
- **Alaskan Air Command** also apparently is doomed, with air defense responsibility again being shifted to the Continental Air Defense Command.
- **U. S. Air Forces Europe** has shifted "residual specified command functions" to U.S. Commander-In-Chief Europe, effective July 1, 1956.

Immediate Washington reaction was that overhauling of the high command at these foreign stations may bring closer the gradual withdrawal of U.S. military personnel, particularly ground forces. In Japan and Europe, the move probably is designed to encourage greater effort by our allies to provide more soldiers and arms. This would permit the U.S. to concentrate on massive retaliation weapons as a deterrent to global war.

Meanwhile, the Pentagon and White House faced other problems of budget-balancing, political reverberations—both national and international—and inter-service rivalries. Major decisions are expected, some before election day, with these strong possibilities:

- **No significant increase** in scheduled output of Boeing B-52 jet bombers is anticipated despite the fact that it was strongly urged in debate before Congress added $800 million to USAF's Fiscal 1957 aircraft procurement funds (AW July 2, p. 30).
- **Revolt of the Army** against the massive-retaliation concept and the trend towards fuller dependence on nuclear weapons will become more insistent as manpower is cut, and the Army takes the heaviest slash.
- **USAF will spend** the extra $100 million voted by Congress for research and development, primarily on the ballistic missile programs.
- **Military fight** with the Administration over money will get hotter when the Fiscal 1958 budget is considered. Low spending in the current year will help force up the amount needed for real necessities starting next summer.

Gen. Nathan F. Twining, USAF chief of staff, said his program will provide for effective use of the $900 million added to the budget despite the assertion by Defense Secretary Charles E. Wilson that the money is not needed. Gen. Twining indicated production of Boeing KC-135 jet tankers will be stepped up in accordance with Strategic Air Command's demand for modern planes to give the B-52 Stratofortress true intercontinental range.

The Air Force recommendations will go to USAF Secretary Donald A. Quarles, who also said the original budget was austere but would suffice. From there they will go to Wilson. In addition to the tankers, observers believed stepped-up purchases would be sought for some fighter aircraft, including the Lockheed F-104.

On the subject of congressional enthusiasm for the B-52, it was pointed out that SAC already is short of bases, personnel and housing for adequate operation of the scheduled 11 wings of 45 aircraft each. An increase in the number of B-52 wings would be possible only by converting units from the smaller B-47 unless the 137-wing goal for USAF is increased. The latter is a change that would require action by the Joint Chiefs of Staff, as well as White House approval.

In addition, ordering an output of B-52s in excess of the scheduled 20 a month would mean that the Boeing plants in Seattle and Wichita would have to employ additional manufacturing personnel. It would also cancel earlier efforts to stabilize production over a longer period.

Gen. Twining also said last week that a replacement for the B-52 will not materialize before 1962.

The storm over projected manpower cuts in the military services started with a report that Adm. Arthur W. Radford, chairman of the joint chiefs, wants cut of 800,000 men in the armed forces by 1960. The move will be resisted by the chiefs of staff of the Army, Navy and Air Force, who are expected to carry their case to the White House but have been dissuaded from doing so until after election day.

It was reported that Secretary Wilson had ordered the Fiscal 1958 budget estimates held to approximately the 1957 level. Because USAF costs are high and destined to grow even more as the 137-wing goal is reached and aircraft become more expensive, the Defense Secretary apparently believes manpower cuts are the only way economies can be made.

Defense spending must increase $7 billion a year to keep the forces at present size.

Adm. Radford says he has not made his final decision, and it is probable that the slash will be closer to 300,000 than 800,000 men when compromises are made on the program later this year.

Regardless of which figure holds, the cut indicates that American forces will be reduced in Europe, and the U. S. will place even-stronger dependence on nuclear weapons delivered from distant points to prevent or win a war. This will have repercussions, not only in domestic politics but in U. S. relations with the NATO powers.

Hebert Subcommittee Declares Airframe Profits Not Excessive

Washington—The House Armed Services Investigating Subcommittee declared last week that the over-all profits of the 12 major U. S. airframe companies have not been excessive.

The subcommittee, in a report issued after a year's study, said profits claimed under individual contracts "are higher than they ought to be, but we consider that redetermination will adjust this."

Other points on the airframe industry made by the subcommittee, headed by Rep. Edward Hebert (D.-La.), were:

• **Profits on military business** should be considered largely in terms of "management fees." The subcommittee said it was "not impressed" with the "heavy emphasis" placed by the industry on "earnings on sales".

• **Rental charges** on government facilities used in military manufacture should be abandoned. "The government interests would be better served if it took its return in reduced costs of the airframes produced."

• **Preference and encouragement** should be given to manufacturers who want to purchase "scrambled" facilities (partially owned by the government, partially by private interests) for commercial production. At present, if a plant is declared surplus, it must be offered on competitive bid.

• **Distribution of profits** in dividends of the 12 companies has been "conservative." Applauding the industry's plan to invest $350 million private capital in facilities over the next few years, the subcommittee commented that "these companies have a creditable record of plowing back into their plants between 60 and 70% of net earnings after taxes."

• **Renegotiation Board's policies** fail to give industry a necessary "degree of assurance" as to its financial status. The subcommittee said "the ground rules relating to earnings and profit must be more certain." It added that "we think it inexcusable to allow statutory renegotiation to be four years behind."

• **Salary allowance schedules** for executive compensation which could be charged against government contracts should be set up. The differing policies of the Air Force and Navy on salaries, bonuses and incentive payments, it said, has caused "a welter of confusion." The subcommittee also noted that "these 12 companies have widely varying policies on the compensation for executives."

• **Salaries of military** and government-employed civilian personnel, "expected to match wits and wisdom with the representatives of the contracting companies, is grossly inadequate."

• **The "risk" aircraft companies** assume in investing in designs for competitions, as well as "the ebb and flow" of military requirements, should be taken into account in determining profits.

• **Aircraft firms should be** encouraged by the military services to stimulate training in science and technology from the high school level on.

• **"Specialized skills" of retired** military officers should be utilized by industry. "But there is a very clear line of demarcation between such positions and the roles of management and advisory groups where there is very little evidence or definition of what is supposed to be done and what the relationship is to be with the military establishment," the subcommittee commented. "The presence of retired military personnel on payrolls, fresh from the 'opposite side of the desk' creates a doubtful atmosphere."

Handley Page's Victor

Production Victor, Handley Page's giant bomber for the Royal Air Force, shows minor external differences from the experimental planes. Vortex generators have been fitted to outer panels of the crescent wing. Dorsal fin has been eliminated, and "bullet" at juncture of horizontal and vertical tails has been reduced in size and altered in shape. Additional windows are located above the crew positions like skylights. Nose has been lengthened by a few feet. Performance of the bomber is subsonic; operational altitudes are above 50,000 ft. Powerplants are four Armstrong Siddeley Sapphires rated near 10,000 lb. thrust each. More than a dozen of these bombers have been produced and are ready for operational use by RAF's Bomber Command.

North American Gets Jet-Trainer Contract

Washington—North American Aviation, Inc., has received a contract to develop its first jet trainer for the Navy.

Work on the two-place basic trainer is scheduled to begin immediately at North American's Columbus Division. The aircraft, to be powered by a Westinghouse J34 turbojet with 3,400 lb. thrust, is designated the T2J.

The aircraft is scheduled to have a top speed of over 400 kts., a service ceiling of above 40,000 ft. and a range of approximately 800 nautical miles. Overall length of the trainer will be about 38 ft.; its wingspan, 36 ft.

Designed to operate from aircraft carriers, the T2J will provide basic pilot, instrument and gunnery training.

GE Receives $107 Million J79 Contract

General Electric Co.'s Gas Turbine Division at Cincinnati has been awarded two USAF contracts totaling $107.5 million. One contract for $102.4 million is for J79 engines, the second of about $5 million is for facilities connected with an advanced engine development project.

The new facilities will consist of test equipment and machine tools. J79 powers Lockheed's F-104A.

Not all manufacturing under the long term J79 contract will be at GE. Company said some of it will be subcontracted, as was GE's J47 which powered F-86, B-47 and B-36.

Adm. Combs Predicts More Navy Transports

Washington—An increase in the Navy's air transport program was predicted by Vice Adm. Thomas S. Combs, deputy chief of naval operations in testimony before the Senate Airpower Investigating Subcommittee.

Adm. Combs said a review of Navy requirements in this field "is being made in the light of the increased military and economic advantages to be gained by broader use of air transport and increased awareness of the vital importance of maximizing the effectiveness of combat forces in being in the first days of an atomic war." He added:

"We anticipate that this review will indicate increased requirements for Military Air Transport Service and also the need for increased capability for naval organic airlift."

In addition to MATS, on which Navy relies for main-line airlift, Combs said the Navy requires additional airlift for these types of operations:

- **Feeder service** to points not serviced by MATS.
- **Close support airlift.**
- **Airlift of Marine** assault forces.
- **Seaplane support** for surface forces, submarines and delivery of assault forces.
- **Shore-to-ship** and ship-to-ship helicopter delivery.

In other testimony, Rear Adm. W. A. Schoech, assistant chief of the Bureau of Aeronautics, outlined the directions of the bureau's research and development effort in testimony before the subcommittee headed by Sen. Stuart Symington (D.-Mo.).

Projects being pushed by the Navy, Adm. Schoech said, include equipment for launching and recovering high-performance aircraft and missiles of the future from carriers and from restricted landing strips near beachheads, equipment to refuel and support seaplanes in advanced ocean areas and high capacity arresting gear to arrest aircraft.

ICAO Urges Task Force For Jet Age Problems

Caracas—International Civil Aviation Organization ended its tenth assembly last week after approving a number of resolutions including one to set up an international task force to deal with problems of air navigation in the jet age (AW July 9, p. 43). The ICAO council will establish a panel of experts to work under council direction, with the aim of completing its studies by the end of 1957.

Other resolutions called for special attention to problems of providing air navigation aids, implementation of regional plans and standards, joint civil-military use of airspace, assistance to airports, simplification of customs and immigration requirements to facilitate international travel, aviation law, and the economic implications of long-range jet operation. ICAO also will ask increased allocations from the United Nations for technical assistance missions and training centers.

United Aircraft Spends $212 Million

H. M. Horner, chairman of United Aircraft Corp., has reviewed the funds of its own that United has provided for facilities and equipment since 1946. The figures:

- **$132 million for new production facilities.**
- **$80 million for experimental facilities.**

The total is $212 million. In these ten years, Horner said, the corporations three divisions have increased their plant space from 3.8 million sq. ft. to 10.2 million sq. ft., 8.1 million wholly owned and the rest leased. An additional 568,000 sq. ft. of space is under construction.

Stroukoff Building AF Transport

Stroukoff Aircraft Corp. last week announced that it will construct an assault transport for the USAF incorporating both boundary layer control and Pantobase all-surface landing gear. The first aircraft, designated the YC-134, is scheduled to roll off Stroukoff's Trenton, N. J., production line sometime this fall.

The aircraft, to be built under a $4 million USAF contract, will be powered by two Wright R3350 engines driving four-bladed Aeroproducts propellers. According to Stroukoff, the YC-134 will be able to take off and land in less than half the time and distance required by conventional aircraft in its 65,000-lb. weight class.

Fuselage of the aircraft will be fitted with a truck-height tailgate door and a forward compartment door 60-inches high by 90-inches wide.

The YC-134, with a design gross load of over 25,000 lbs. in cargo or combat troops, will have a wing span of 112 ft. and an overall length of 83 ft.

The Pantobase and boundary-layer-control concepts developed by Stroukoff already have been tested on a modified version the C-123.

STROUKOFF YC-134 boundary layer control and Pantobase landing gear permits takeoff and landing in rough terrain with heavy load.

Law Proposed to Cure Security Abuses

By Katherine Johnsen

Washington—National secrets legislation to hold down the widespread abuse of over-classification of legitimate information under the guise of security has been proposed by Trevor Gardner, former assistant secretary of the Air Force for research and development (for Gardner's views on missile program see next page).

Gardner, who also called for severer penalties against persons who disclose bona fide security information, made his recommendations before the House Special Subcommittee on Information that is headed by Rep. John Moss (D.-Calif.).

He cited these instances of over-classification:

• **A scientist of "international** reputation" and cleared by the USAF, was refused clearance by another service. As a result, the Air Force engaged him only on non-classified projects.

"Unfortunately," Gardner testified, "this man has such inventive ability that he keeps coming up with secret and top secret ideas, even though his clearance is removed. As soon as he gets some interesting results, we classify the results and he no longer has access to them. We can't seem to classify his head.

"He keeps coming up with secret ideas. . . .

"It is very difficult to classify laws of nature . . . they don't stay classified very long."

• **Delay in release** of pictures and information on the Moscow flyover of May 5, 1955, was "simply not sensible. Our clearing people . . . didn't seem to understand that 52 other nations had seen the show." At first, he said, "the idea was toyed with" of not releasing any pictures at all. "The first statement that was made was a very general one—simply saying that new types of aircraft had been shown."

• **President Truman's order** to drop the atomic bomb in World War II, Gardner reported, "is probably still classified top secret."

• **U. S. refused** to allow the French to use the proximity artillery fuse at the battle of Dien Bien Phu, Indo China, because it had been classified "top secret" since World War II. Later, it was discovered that there had been a stock of 20,000 fuses in France, guarded by French soldiers.

'Top Secret' a Coverall

At one time, Gardner recalled, "I received an instruction to cancel an important program, and the instruction itself was classified 'top secret.' Had I carried out the instruction I would have violated the top secret application of the instruction."

Although the speed of the 5,000-mile intercontinental ballistic missile was classified as secret, Gardner told the subcommittee that this could have been determined from information available in high school text books.

He added: "I was imminently unsuccessful in trying to get the simple facts concerning the organization and the scope of the ICBM program—even the names of contractors—released."

There are over one million people in the government who can originate classified documents, Gardner noted. "I think it follows rather logically from that—and my experience bears out the fact—that the criteria these individuals use in establishing whether a document should be confidential, secret or top secret is not necessarily uniform."

He said that frequently classification is used to save departments, agencies, or individuals from "possible embarrassment."

Military System

"We are today," he added, "applying what was essentially a military system to what is essentially a laboratory scientific situation."

Gardner said he "would greatly favor reducing the amount and kind of classification in the research and development area in favor of making more rapid progress." He said that there "definitely is resistance on the part of scientists to submit to clearance procedures" and that "very definitely the security system is causing the loss of service of men who could make valuable contributions to defense."

Lt. Gen. Floyd Parks (ret.), who headed the Army's public relations office under several secretaries and chiefs of staff, told the Moss subcommittee that "the principle difficulty stems from the Army's lack of knowing how to furnish information rather from any desire to hold the information back." He added:

"The average military man is so used to playing the military game of keeping information from the enemy that he is not by nature the type of fellow who wants to give out news."

The solution, Gen. Parks said, is the establishment of a "career pattern" for Army information personnel. This "will insure the retention of qualified officers who know the problems of the communications media. They must be assured of promotion based on performance of duty as information specialist.

"In the past, officers have avoided information assignments because they felt that such service retarded their careers, prevented or delayed promotion, and seldom gained recognition for a task well done."

Information Budget Cuts

Gen. Parks maintained that it would be "easier for the military to learn the news media set-up than for civilian newsmen to acquire a knowledge of the military."

Gen. Parks also protested what he termed the encroachment by the Office of Information of the Secretary of Defense into various service information activities.

The Defense Office, he said, goes "beyond the policy area, which was the original reason for its establishment, into the operating area—which makes the reporter one step further from the news source than necessary and proper."

The Defense Office, he added, should be "a very small organization to promulgate broad overall policies . . . and handle information for the Secretary of Defense."

Over the past few years, Gen. Parks said, the Army's information budgets have been reduced from $4 million annually to $830,000.

In addition, he protested, the Defense Office one year "required each of the services to furnish 20 people to its office."

Their salaries "were charged to the services' limited allotments."

New Altimeter by ARDC

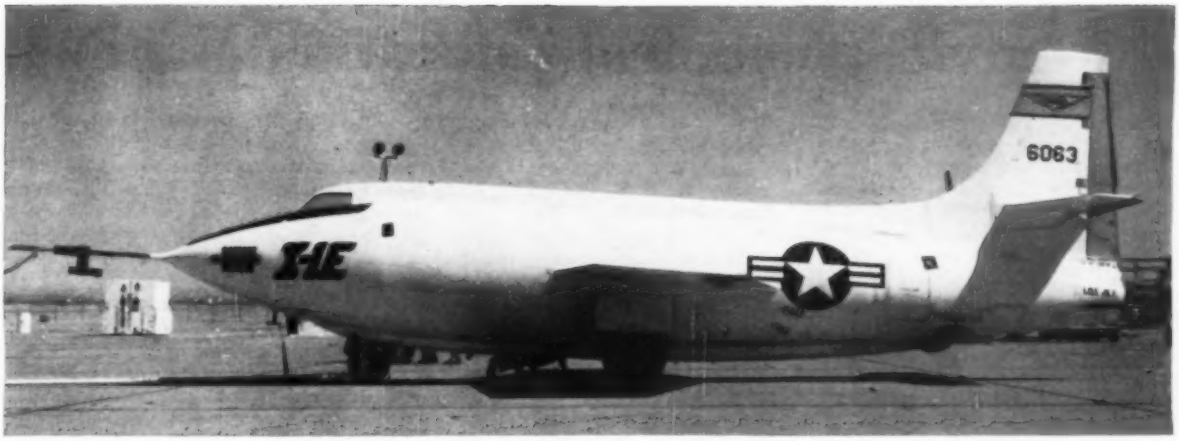
The Air Research and Development Command last week announced the development of a new altimeter "400% more accurate" than present instruments below 50,000 ft. and "100% more accurate above that altitude."

The new altimeter will, the ARDC says, permit the Air Force to reduce vertical distance between aircraft in flight from the present 2,000 ft. to 1,000 ft.

Maximum altimeter error at 10,000 ft. has been reduced from 350 ft. in present instruments to 80 ft. in the new altimeter; at 30,000 ft., from 900 ft. to 180 ft.; at 50,000 ft., from 1,500 ft. to 280 ft., and, at 80,000 ft., from 3,000 ft. to 1,500 ft.

Known as the MA-1, the altimeter already has been installed in a number of Air Force planes on a test basis. In tests, it has maintained its accuracy from −35C to 70C.

Range of the altimeter, developed by the Wright Air Development Center in conjunction with Kollsman Instrument Corp., Elmhurst, N. Y., is 80,000 ft. above sea level.



Research Rocket Craft

NACA research rocket aircraft, the Bell X-1E, differs from earlier versions because of its extremely thin wing and pumped propellants. The new surfaces, designed and built by Stanley Aviation Corp. (AW April 25, 1955, p. 42), are only 4% thick contrasted to the 10%-thick panels of the first X-1s. Cockpit reflects Douglas practice in the Skyrocket rather than the ogival nose of the first X-1, or the semi-bubble canopy of later models. Turbopump is used to drive the liquid oxygen and alcohol to the motor; first versions of the X-1 used nitrogen under pressure to feed oxidizer and fuel. Drag reduction due to thinner wing plus extended endurance because of the turbopump's smaller volume and weight were expected to produce speeds greater than record mark of Mach 2.5 attained by the X-1A.

Gardner Warns Russia Is Ahead On IRBM, Blames U. S. Rivalries

Washington—Trevor Gardner, former assistant secretary of the Air Force for research and development, believes the Soviet Union may win the race to develop an intermediate-range ballistic missile because of interservice competition in the U. S. which wastes talent and facilities.

Gardner told an executive session of the Senate Airpower Subcommittee that this country holds an advantage in the effort to perfect a 5,000-mile range intercontinental ballistic missile (ICBM) but is handicapped by the struggle to get test-range time.

He said high-caliber executives working on the ICBM "spend most of their time in co-ordinating committee meetings, talking about how to avoid interferences, and there is very little time actually running the project."

Other highlights from Gardner's testimony:

• **High-altitude performance credited** to Russian fighters is "one of the most alarming things" about Red air capability. This indicated that USAF intelligence reports show Russian fighters can perform at higher altitudes than our B-47 and B-52 jet bombers.

• **Development of the Russian Bear** turboprop bomber as a tanker would enable the Reds to deliver nuclear bombs to the U. S. "heartland."

On his recent trip to Russia, USAF Chief of Staff Nathan F. Twining saw evidence that the Russian air force already is using aerial refueling to extend the range of bombers (AW July 16, p. 31).

• **Russian ballistic-missile** development is ahead of that of the U. S., "compared with where we are now."

• **Russian knowledge** of electronics and computer techniques "is quite advanced." This is shown by the appearance of radar bulges on Russian aircraft and the apparatus displayed at the Atoms for Peace meeting held in Geneva. The latter "suggested a level of understanding and component development which we really hadn't believed they had achieved yet."

• **Russian technical papers** in almost every field "are quite alarmingly good, particularly in physics, mathematics and chemistry."

• **Continued support for NATO** is essential because the U. S. still does not have a true intercontinental bombing capability.

• **U. S. does not have** an adequate air defense, either electronically or in aircraft.

• **Among projects set aside** by the Administration for economy reasons are a new bomber, presumably one that would replace the B-52, and further development of boundary-layer control and high-energy fuels.

Gardner, who resigned his post early this year in a disagreement with Defense Secretary Charles E. Wilson and USAF Secretary Donald A. Quarles over development policies, said he believes the Russians have an IRBM with a range of 700 to 800 miles "and that does them a lot of good." Such a weapon could be fired into NATO countries from behind the Iron Curtain. The former assistant secretary pointed out that there are 15 or 20 ballistic missile programs involving the Army, Navy and Air Force. He said they tend to get in each other's way in competing for engines, engineers and firing ranges.

He described the Vanguard satellite program at Martin Aircraft Co. as "just another of the programs that tend to interfere."

Four memorandums which passed between Gardner and the office of the Air Force secretary were put in the committee record after being declassified.

There was no explanation given as to why they ever were classified, although there were three security deletions.

The memos set forth details of the dispute that led to Gardner's resignation, starting with his observation in May, 1955, that the press reported spectacular Russian advances, that President Eisenhower paid lip service to the importance of technology and that Secretary Wilson suspected there was a great amount of waste in the research-and-development program.

Subsequently, he pressed the issue in January of this year with a request for an additional $316,649,000 for Fiscal 1957.

In reply, Secretary Quarles listed seven actions he said could be taken in the interest of economy. On Feb. 10, Gardner replied, pointing out the suggestions that had been used or else could not be used. He resigned the next day.

Soviet Technical Education Marshalled f

By Robert Hotz

Moscow—The Soviet drive aimed at developing superior airpower is being built upon a foundation of large-scale technical education in aeronautical skills and sciences that stretches from model airplane building shops to rigorous post-graduate technical specialization.

The Soviet aeronautical education system is designed to attract the most promising segments of its youth to aeronautical careers and then sift them through a fine-mesh screen that gives the most talented an opportunity to fill key engineering, scientific and military posts but also utilizes the lesser grades of skilled personnel at appropriate levels in the expanding civil and military aviation structure.

Grass-Roots Training

Some of the general outlines of how this aeronautical education system is organized can be gleaned from observations within the Soviet Union and consultation with non-Russians who worked in this country during the postwar period.

The Soviets carefully nurture the grass roots of their aviation development through a program attractive to youth of both sexes. State-supported model airplane building shops are available all over the Soviet Union. This is where most young Russians begin their aviation careers. These model building shops, which cater to about 25,000 young Russians in the Moscow area alone, are operated by DOSAAF, the voluntary aid society for the Army, Navy and Air Force, which also sponsors the grass-roots flying and glider clubs that are the next step upward for the most promising of the model builders.

The flying clubs operated by DOSAAF provide ground schooling, flight training in Yak-18 monoplanes, glider training and parachute jumping. From the hundreds of thousands of young Russians trained in aviation fundamentals by DOSAAF come the military pilots of the Red air force, the civilian pilots of Aeroflot, the students for the aeronautical technical institutes and the cream of the crop who are invited to enter the military air engineering academies. Soviet aviation leaders feel strongly that this massive, grass-roots aviation program is an essential base from which the large numbers of technical specialists required by expanding Soviet aviation can be screened.

Technical Institutes

There are now seven aeronautical technical institutes in the Soviet Union with a total enrollment of close to 25,000 students. These institutes are all located in aeronautical production centers and work closely with the design and production teams at these centers. Senior engineers may also teach in the institutes, and students have several on-the-job sessions in nearby aircraft, engine or components factories as part of their training.

The aeronautical technical institutes now operating are:

- **Ordzhonikidze Aeronautical Institute** in Moscow, the largest aeronautical school with about 7,500 students. It works closely with the aircraft and engine plants in the Moscow area.
- **Moscow Institute of Air Technology** with about 3,500 students specializes in aircraft production techniques.
- **Kuibyshev Aeronautical Institute** with about 2,000 students specializing in aeronautical and powerplant engineering and working with the major airframe and engine plants in that city.
- **Kharkov Aeronautical Institute** with about 2,800 students working with both airframe and engine plants.
- **Kazan Aeronautical Institute** with about 2,500 students and working with the airframe plants in the area.
- **Leningrad Air Equipment Institute** specializes in preparing engineers to work in the auxiliary equipment and component industry and can accommodate about 2,500 students.
- **UFA Aeronautical Institute** is the smallest with less than 1,000 students and training primarily powerplant engineers.

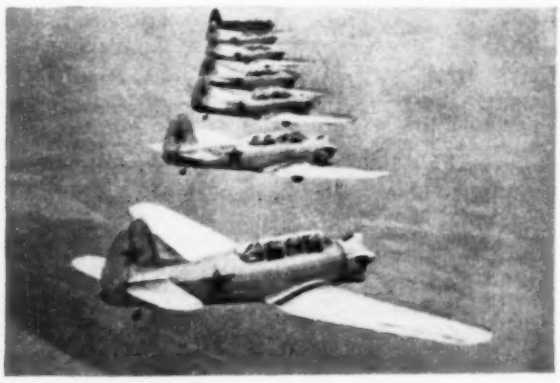
These institutes graduate about 3,000 aeronautical engineers annually. They are absorbed primarily by the airframe, engine and components factories with some of the most promising graduates receiving minor positions in the Ministry of Aircraft Production.

Air Force Institutes

On the military side, the Red air force operates three technical institutes:

- **Zhukovsky Air Engineering Academy.** This gets the cream of the Soviet technical crop. Both education and political backgrounds must be impeccable to enter here. Entrance is by invitation only after careful screening by the Communist Party. This academy, visited by Gen Nathan F. Twining and his party, offers a five-year, highly-advanced course in aeronautical engineering and accommodates about 2,500 students. Gen. Twining reported that candidates must have at least five years prior service in the Red air force and fall between the ages of 24 and 32. Other sources indicate that candidates come directly from other aeronautical technical institutes and are commissioned as second lieutenants in the engineering service of the Red air force on entrance at the academy.

There is little doubt, however, that the goal of the academy is to turn out the top technical people in the Soviet aviation structure. Its graduates staff



RUSSIAN flight students are trained on Yak 18s in the flying clubs. The best are selected to fly . . .

ed for Airpower Drive

the most important positions in the Ministry of Aircraft Production, particularly in the bureaus responsible for drawing up specifications for new military and civil aircraft types. They also serve in key engineering posts in the Red air force such as the experimental center at Ramenskoye.

Professors teaching at the academy get about 40% higher pay than those at civil technical institutes and many of them are top research and scientific personnel who also work in aeronautical research institutes such as TSAGI (Central Aero and Hydrodynamic Research Institute) just outside Moscow.

Gen. Twining noted some extremely advanced research tools being used to teach Zhukovsky academy students such as Mach 3 and Mach 5 wind tunnels, cutaway airframes and engines of late-model aircraft including the Yak-25 all-weather fighter and the MiG-19 supersonic day fighter, an unusually-fine variety of very-high-speed cameras and an excellent metallurgy department. The electronic department, Gen. Twining noted, appeared to be substandard using mostly equipment copied from the West.

• **Leningrad Air Engineering Academy** which specializes in training military aircraft designers.

• **Riga Military Air Engineering College** which specializes in training military engineers in aircraft maintenance.

Senior Engineers Lacking

Although the Soviets have been pushing hard for the past five years in expanding their output of aeronautical engineers, there is considerable evidence that the lean post-revolutionary years in education and political purges have left only an extremely small group of senior, experienced aeronautical scientists, engineers and teachers. It is common practice for these senior men to teach at a technical school, serve as advisers to a government bureau, participate in design or production work and act as consultant to a specific industrial complex.

One evidence apparent to foreign observers of this lack of seasoned scientists who can also teach is the tremendously detailed aeronautical textbooks that have been published during the past five years. These detailed texts by top Soviet aviation experts appeared to be aimed at alleviating the deficiencies of mediocre teachers by supplying vast amounts of detail from the few available experts who are also drafted to produce textbooks.

This shortage of old hands may also explain why so many new Soviet aircraft designs are credited to a relatively few senior designers. For example, Yakovlev with an all-weather fighter series and a large twin engine helicopter; Ilyushin with a large turboprop bomber, two transport series and a supersonic bomber; Mikoyan with four new fighter types in six years, and Tupolev with a wide variety of transports and bombers. Pavel Sukhoi is the only new name to appear among the Soviet design galaxy since the Korean war.

Similarly in the engine field, such old standbys as Lulka, Klimov and Mikulin are still being credited with the wide spectrum of Soviet gas-turbine designs.

In broad terms, the Soviet aircraft development system works as follows:

Requirements for new aircraft types are originated by the Red air force and Aeroflot, with the latter gaining more influence than it previously had as Soviet policy emphasizes the need for fast communications with Asia and the West.

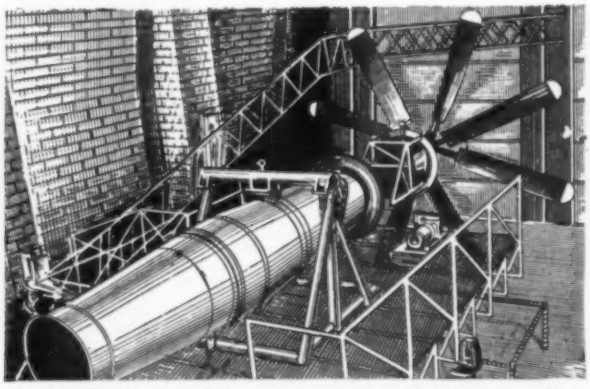
The Red air force plans and requirements sections are heavily loaded with Zhukovsky academy graduates.

These requirements are passed on to the Ministry of Aircraft Production where they go to a design bureau for execution. These design bureaus have Zhukovsky graduates in many top positions but are staffed mostly by graduates of the aeronautical technical institutes such as the Ordzhonikidze in Moscow.

These design bureaus, which can run up to 300 people, prepare detailed designs that are tested and analyzed by facilities such as TSAGI and then assigned to an industrial complex for production of prototypes. The Soviets do considerable prototype testing before finally putting a new design into heavy production for the Red air force inventory.

FLIGHT SIMULATOR is used in preliminary instruction to flying club class.

. . . **SUPERSONIC** Farmers and other air force types.



TURBOPROP engine has contra-rotating propellers similar to Bear.

End of Piston Era Comes for Boeing with KC-135A Rollout

Seattle—Boeing Airplane Co. rolled out the first production model of its USAF tanker-transport at its Renton, Wash., plant last week. The rollout ceremony of the KC-135 was conducted simultaneously with that of Boeing's last piston-powered craft, KC-97 tanker number 888, also for the Air Force.

The new airplane, a KC-135A-BN-1, was Air Force Serial Number 55-3118A. Like Douglas C-133A rolled out earlier this year, there is no X or Y model. For Boeing, the Model 707 has served as a prototype for flight test work, including installation of a refueling boom.

The second KC-135 is being used in static test, while the third and fourth are being put together on the Renton assembly line.

Major differences between the 707 and KC-135A include:

- **Radar nose,** plus addition of a probe antenna on the vertical stabilizer and a number of flush antennas for USAF navigational, avionic and radar gear.
- **Addition of split** trailing edge flaps on the inboard section of the wing, under the fairings, called wing fillet flaps. On the prototype, tests with a fixed installation indicated desirability of the addition.
- **New refueling** signal lights system are placed well forward of the former location on piston-powered KC-97 tankers.

The plane carriers 4,500 gals. in its forward fuselage tank, under the main compartment, 6,380 gals. in its aft fuselage tank, also under the floor of the main compartment, and 17,398 gals. in seven wing tanks, two mains and an auxiliary on each side, plus a wing center section tank. Fuel management, including transfer from wing to fuselage to boom for supply to another aircraft, is accomplished from a control panel on the pedestal between the pilot and copilot. The KC-135 can dispose of all fuel aboard, saving only enough for its own landing, if the situation demands. Total possible fuel capacity is 28,378 gals.

Maximum gross weight on the KC-135A runs very close to 270,000 lb., wing area is 2,433 sq. ft. for a wing loading on the order of 110 lb. per sq. ft. The commercial airplane, the 707-120, has a maximum gross weight of 248,000 lb. with operational takeoff weights expected to be on the order of from 235,000 lb. to 243,000 lb.

On the pilots side is a set of flight instruments and primary engine gages. Copilot has flight instruments and main engine gage installation. Just behind the copilot is the navigator's station with its control panel for avionics and scope for navigation and other radar. Behind the pilot is an extra seat for an instructor pilot or other extra passenger.

In the commercial plane, a systems engineer will have the engine and other gages, and the pilot a scope for the weather and forward directional radar. The main electrical panel and circuit breakers are located at the station behind the pilot.

The aircraft uses four P&W J57 turbojet engines in the 10,000 lb. thrust class. Using water injection on late dash numbers of engines, the KC-135 can achieve a wet takeoff thrust of 13,500 lb. per engine. The plane has a Lear autopilot, uses hydraulic steering by a separate wheel for the nose gear, which swivels 53 degrees to either side.

Landing gear and refueling boom are hydraulically operated, with the main gear using a four wheel bogie to reduce footprint pressures.

A feature of the pilot's compartment is the inclusion of two small windows on the overhead ceiling, giving the military and commercial versions improved visibility over current types.

KC-135 rollout was conducted along with that of Boeing's last piston-powered airplane, USAF KC-97 tanker number 888. Along with it the company built 56 commercial versions and the Model 377 Stratocruiser for a number of airlines.

First plane out of the hangar was christened the "City of Renton," in honor of the city where it was assembled.

Guests at the rollout included Gen. Edwin Rawlings, commander, Air Materiel Command; Gen. C. S. (Bill) Irvine, USAF deputy chief of staff for materiel; Maj. Gen. Glenn Griswold, vice commander, Strategic Air Command, using agency for the KC-135. Representating Boeing were William M. Allen, company president, and J. B. Connelly, Boeing vice president and general manager of the transport division.

KC-135 will be built on one line at Renton for now, with a second line to be initiated in the near future. On a third parallel line, the company's Stratoliners will be built.

There is close relationship between the tanker-transport and commercial airplanes. Tanker carries all transferrable and its own fuel in wing and fuselage tanks under the main compartment floor, leaving the huge main compartment free for cargo or passenger transportation, or a combination of the two up to the plane's maximum gross weight.

Lockheed T2V-1 Trainer Crashes at Palmdale

Lockheed T2V-1 jet trainer landed 200 ft. short of runway at Palmdale jet test center, Calif., last week and was damaged considerably but no fire resulted.

Plane, piloted by Ray Crandall, was engaged in routine flight test work at time of crash.

KC-135 ON ASSEMBLY line shows additional, small windows on overhead ceiling just above large windows of type found in usual commercial and military transports. Plane has separate wheel for steering nose gear which swivels 53 degrees on either side.

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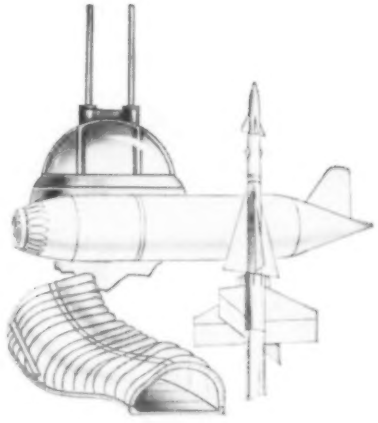

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Rockoons Aid in Solar Flare Study

Solar flare effects on radio frequency wave propagation are being studied by the Navy, using balloon-supported rockets called Rockoons. They have been launched from the USS Colonial (LSD-18) 200-400 mi. west of San Diego, Calif., in preliminary research rocket firings for the International Geophysical Year.

Under direction of Dr. Herbert Friedman, Optics Division, Office of Naval Research, the series of ten firings began July 16 and will continue until July 30.

For each test a 12-ft. Deacon research rocket is sent aloft, usually in the morning, suspended from a 68-ft. diameter Skyhook balloon. The balloon takes the rocket to approximately 80,000 ft. Each rocket carries an instrument payload of 20 lb. and floats above the ocean before firing, awaiting detection of a solar flare by observers aboard the Colonial.

Solar flares rise to a maximum in minutes and NRL scientists using conventional rocket techniques have been hampered by the time taken to detect the flare, and to launch the rocket and wait for it to reach the altitude necessary for observations. The ship-controlled Rockoon technique will minimize the latter. It is expected that a minimum time-lag of 90 to 120 seconds between the decision to fire and the attainment of the required observational altitude can be achieved.

Once the balloon-rocket combination has been launched, the rocket is committed for firing within approximately 8 hr. The decision to fire is based on the occurrence of a detectable flare which can be expected about once every 50 hr. at this time of year.

Because of the relative unpredictability of flares, some firings probably will take place in the absence of flares and the results used for comparison.

Solar flares can be detected in two ways. One is sudden fadeout of medium- and short-wave radio receivers aboard the ship. A second method makes use of an optical telescope coupled to a closed-circuit television system.

The telescope has a red filter corresponding to the spectroscopic line of a solar hydrogen flare.

When decision to fire has been made, coded signals from a shipboard transmitter activate the research instruments in the nose of the rocket and energize the rocket igniter. As the rocket accelerates it shatters the plastic balloon and in the next 90 to 120 seconds is expected to attain an altitude of 60 to 70 mi. In its trajectory it telemeters to the observing station aboard the Colonial data on the strength of radiations from the flare.

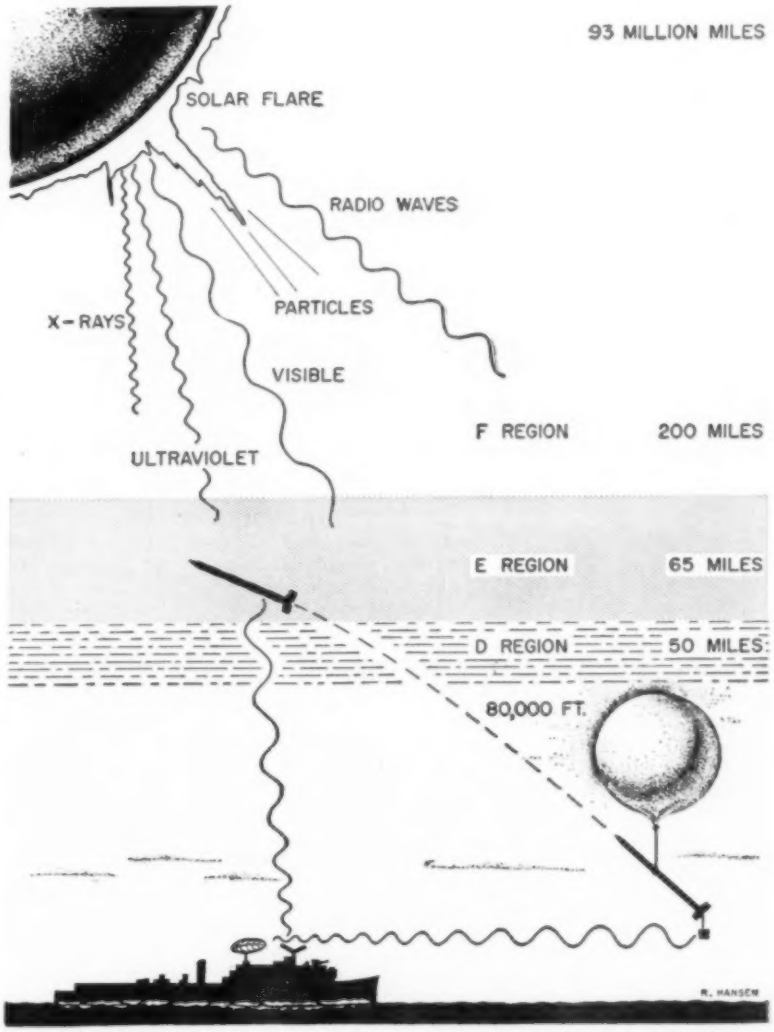
The Deacons carry photon counters sensitive to radiation from the sun in three wave-lengths; 1216 P angstroms, 1-10 angstroms, and 0.05-1 angstrom. These wave-lengths correspond to the Lyman-alpa line of hydrogen, X-rays, and soft gamma rays, respectively. These are believed to have independent but cumulative effects on the ionosphere.

During the International Geophysical Year, solar activity will reach a maximum. Physicists who specialize in upper atmosphere research are looking forward to exceptionally productive experiments.

Rocket and rocket-balloon combinations have been used by United States scientists for ten years in upper atmosphere research. The Rockoon technique was introduced about four years ago by Professor James A. Van Allen of the State University of Iowa in cooperation with Navy scientists.

The destroyer, USS Perkins, serves as support ship to the Colonial and tracks the Rockoons by radar. Navy patrol planes from San Diego are patrolling the area in which the rockets are likely to land as a shipping safety precaution.

The balloons are made by Winzen Research Corp., Minneapolis, Minn., and have previously been used by the Navy and Air Force in the upper air probing. The Deacon rockets, a solid-propellant type, are manufactured by Allegheny Ballistic Laboratory of Cumberland, Md., operated by the Hercules Powder Co., for the Navy Bureau of Ordnance.



ROCKET-BALLOON Combination (Rockoon) shaves seconds from time lag between decision to fire and observations in Navy Rocket study of solar flare effects on ionosphere and radio communications.

Capital Negotiates for Comet, May Buy 15

London—Capital Airlines, negotiating with de Havilland Aircraft Co., Ltd., may buy as many as 15 Comet 4s and place options on more in an order exceeding $60 million.

Capital has decided on the Comet instead of the Britannia, industry sources in London said last week. In Washington, Capital would not comment on the negotiations which J. H. Carmichael, president of the airline, is conducting in England, but the report was not denied.

Contract, which is expected to give Capital priority over BOAC deliveries, would lift de Havilland out of doldrums. In spite of world sales tour, orders for Comet 4 had stopped with the 20 for BOAC.

Spares Support

De Havilland presumably would set up full spares support in New York or Washington to back up sale. Whatever terms, industry is agreed Carmichael undoubtedly was able to drive a hard bargain in view of British eagerness to get back into the international market with something besides extremely successful Viscount.

Comet will be modified to meet Capital's quick turnaround specifications, with reduced crew and lavatory space and possible integral stairs. Major factor in Carmichael's interest in British aircraft has been not only success with Viscount, but ability to get delivery dates ahead of U. S. competitors who are in line for American models.

Carmichael previously had explained his interest in British aircraft to AVIATION WEEK this way:

"We now have the lead in the United States with Viscount. Lockheed's Electra will offset that when it goes into operation and we will need something to get that lead back."

When Capital and Bristol were near agreement on Britannia, contract was to include Capital taking over some BOAC deliveries. Carmichael presumably insisted on similar arrangement with de Havilland.

BOAC Disadvantage

British government, anxious to get back into international jet market, could be expected to agree to this even though it meant some disadvantage for flag airline.

Advent of Convair's Golden Arrow medium jet for competing routes apparently was factor in Carmichael's swing away from turboprop. Teething troubles of Bristol Britannia, which Capital seriously considered, may have been another.

Britannia left this week for another African trial of its engine and intake modifications, three engines modified and one unmodified as check. It is now unlikely BOAC will begin Britannia service before October.

Capital decision in favor of jets would be regarded as blow to turboprop picture as whole because Capital has gained position as leader in that field due to its success with Viscounts.

De Havilland success with sale of Comet to Capital does not mean Bristol still is planning an American tour with Britannia after icing problems are licked.

Sale to Capital will put de Havilland back in jet market in big way. It also will indicate to world that Capital has seriously studied possible damage to Comet reputation as result of early disasters and rejected them as having little influence on passenger market. As an expression of confidence in Comet modifications it cannot be exceeded.

CAB Hits Airline Overbooking, Prohibits Bonuses, Free Trips

By Craig Lewis

Washington—The Civil Aeronautics Board has warned scheduled airlines to stop overbooking flights and to quit placating angry customers with cash payments and free trips.

The warning came from CAB compliance office chief James Anton. In a letter to all the nation's scheduled airlines, Anton told the carriers to stop overselling practices or face CAB enforcement action.

Anton issued the warning after a three-month study conducted by the Office of Compliance on airline reservation practices at major eastern terminals.

Overbooking and overselling practices are closely tied to the airlines' no-show problem. Some carriers operating in high density traffic areas reserve and sell more seats than they have available in an attempt to compensate for the inevitable percentage of passengers who make reservations and then fail to show up for the flight.

Complaints Increase

"In recent months," Anton said, "this office has received an increasing number of complaints from persons who have been denied passage on flights for which they held confirmed reservations. We have made a limited investigation and find that some carriers are deliberately overbooking flights to offset the expected number of 'no-shows.'

"This has resulted in failing to transport passengers holding confirmed reservations with consequent inconvenience and hardship to these persons and to others." He added:

"While we recognize that a no-show problem exists, we do not believe that deliberate overbooking of flights is the proper solution. It is the opinion of this office that such a practice and consequent oversales constitute an unfair and deceptive practice within the meaning of Section 411 of the Civil Aeronautics Act," Anton told the carriers.

Compensating 'Bonuses'

The CAB investigation also showed that some carriers are giving free transportation or cash bonuses to oversold passengers as "compensation for inconvenience."

Anton warned the airlines that the CAB regards such practices granting of free or reduced rate transportation or rebates in violation of Section 403 of the Act.

The CAB compliance chief told the carriers he is calling possible violations to their attention and giving them a chance to take whatever corrective action is considered necessary.

"If a subsequent investigation shows that these conditions still exist, appropriate enforcement action will be taken," Anton said.

The investigation of airline reservations policies and practices was launched as the result of a growing number of complaints from passengers whose travel plans were upset when they discovered their flight had been oversold and the seats they had reserved were filled.

Overbooking and overselling flights is a practice developed by some airlines as a calculated risk. Flights are overbooked and oversold in the expectation that no-shows will reduce the number of reservations sold to the number of seats available on the flight.

When this calculation is off, one or

more angry passengers are left at the gate with a confirmed ticket, but no seat. A passenger might make his reservation and buy his ticket weeks ahead of flight time, but, if he should be late arriving at the gate and the flight is oversold, he can't make the trip.

This is where bonuses and free trips come in. Some carriers will give the passenger who misses his flight a cash bonus or free transportation on another flight to make up for inconvenience caused by the oversale.

Pressure on the CAB has come from the public and Congress, with growing demands that the problem be solved. Sen. Margaret Chase Smith (R.-Me.) complained last month in a Senate speech that airlines are overselling seats.

Investigation Disclosures

The CAB study was made in January, February and March of the reservation practices of four airlines. The investigation was conducted along the heavily traveled East Coast from where the majority of the complaints emanated.

CAB investigators checked flights of four carriers at the three eastern points and found records of oversales ranging from one a month for one carrier to 130 a month for another. All flights in all directions from the three points were checked, but the greatest number were along the East Coast.

During the three-month period, the CAB study covered flights on which the airlines boarded more than 600,000 passengers. The same flights recorded a total of 43,000 no-shows. The CAB found well over 500 oversales.

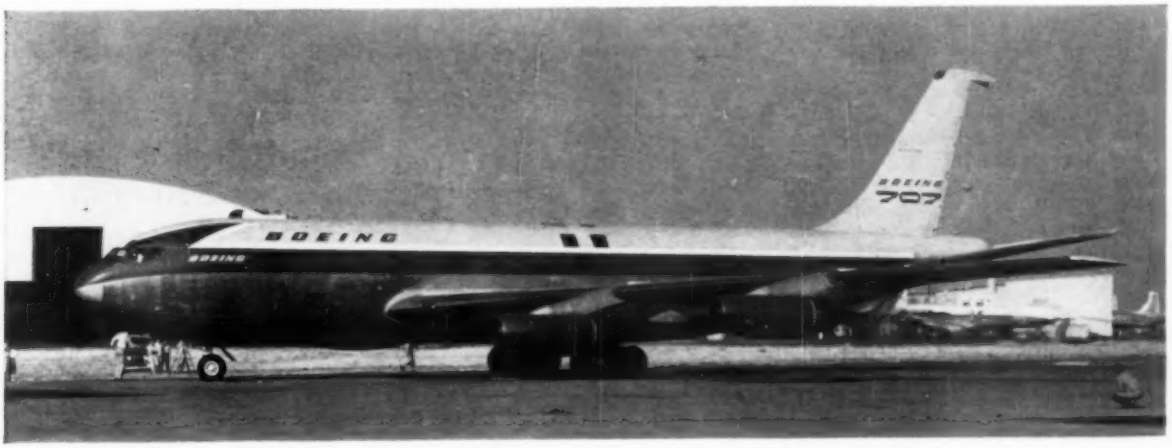
There probably were more than 43,000 no-shows on the flights checked since some of the carriers studied had no no-show figures available for inclusion in the study. The oversale total does not give a complete picture because overbookings exceed oversales, and the CAB investigators concentrated the study on oversales. And many deliberate oversales are canceled by the expected no-shows.

The practice of overselling is used by some carriers operating in large metropolitan traffic markets in an effort to compensate for traffic losses from passengers who fail to show up for flights. The airline industry took steps to solve the no-show problem last month when it agreed on a set of rules designed to discourage the no-show habit (AW July 9, p. 38).

New Plan May Help

Under the new plan, passengers will have time limits for purchasing their tickets after they have made their reservations. Penalties will be imposed for late cancellations and for failure to show up for a flight.

Both the industry and the CAB hope that the new plan, which goes into effect on Sept. 16, will solve the no-show problem and thus remove the need for overselling flights. The CAB Office of Compliance will study the effect of the new reservation program after it goes into effect.



Boeing 707's Visit to Los Angeles

Boeing's 707 jet tanker-transport prototype in the airplane's first visit to a commercial airport—Los Angeles International. Yellow, brown and silver transport was parked at American Airlines loading ramp. Visitors to the airport, pilots, ground crews, engineers swarmed aboard to inspect craft (right). Flight from Boeing's Seattle plant was made in 1 hr. 57 min. with gross weight of 152,000 lbs. and temperature in 80s, plane landed within 4,000 ft. without excessive braking.

Administration Asks $68 Million To Speed Five-Year Airway Plan

Washington—The Eisenhower Administration abruptly reversed itself last week and asked Congress for funds to telescope the Civil Aeronautics Administration's $250-million five-year federal airways program into three years.

Acting in the face of increasing public demand for a safer system as the result of the mid-air collision over Grand Canyon (AW July 9, p. 39), President Eisenhower requested an additional $68 million appropriation over and above the $40 million provided in the CAA's regular Fiscal 1957 budget. The CAA originally had asked for $55 million to get its airways program under way.

The Budget Bureau cut it to the $40 million which was submitted to, and approved by, Congress.

Pressure on Congress

Congress, facing the same pressures as the Administration, probably will grant the request.

Senate Appropriations Committee members, after hearing testimony by Under Secretary of Commerce for Transportation Louis Rothschild on the request, indicated that Capitol Hill will take time to approve the additional funds despite the congressional rush to windup its business. "The urgency of our situation today is so compelling that we felt obliged to ask the help of Congress immediately," Rothschild told the committee.

In his request for additional funds, President Eisenhower stated:

"Since the five-year plan was developed, demands on the federal airways system have continued to grow rapidly. Air traffic has exceeded previous forecasts. Current orders for commercial jet transports indicate their introduction into service earlier and in greater numbers than originally anticipated.

"In the light of these developments, a substantial acceleration of the five-year program is necessary."

Questions Lowen

CAA Administrator Charles J. Lowen was questioned by Sen. Margaret Chase Smith (R.-Me.) during the Senate Appropriations hearings as to why he publicly maintained in May that the $40 million was the maximum amount he could use in Fiscal 1957. Lowen replied that the program already had been drawn up at the time of his appointment and that he felt obliged to support it.

Rothschild, however, interceded that "it would be less than fair if we did not say the Grand Canyon crash pushed us along."

In addition to accelerating the airways program, the additional funds also provide for complete control of airspace above 15,000 ft.—the original plan had called for control above 24,000 ft. Rothschild said the plan was revised since many high-speed commercial transports will fly between the 15,000-24,000 ft. range. The original plan would have accommodated only high-altitude jets.

Rothschild also testified that, if the United Airlines and Trans World Airlines aircraft which crashed at 21,000 ft. had been in a radar control area, "the crash probably would not have occurred."

Lowen told the committee that lowering the altitude for complete control below 15,000 ft. would "deny" needed "speed and flexibility." CAA's approach, he said, is to develop the airways "to conform to the airplane and the needs of air transportation."

Higher Controller Pay?

Rothschild reported that the maximum salary for aircraft maintenance personnel responsible for the check-out of commercial aircraft and control tower operators is less than $8,000 a year, but that the CAA has requested the Civil Service Commission to upgrade its personnel and that this should be accomplished in a few months. Members of the Appropriations Committee generally expressed a willingness to approve any additional funds required to meet the increases.

Strong pressure for action to improve air safety had developed in Congress before the President's fund request.

Three members of the House already had introduced legislation to create a Commission on Air Safety with members appointed by the President. The members would include seven users of airspace, four members of the Senate and four members of the House. Sponsors of the bill were Rep. Prince Preston (D.-Ga.) and Rep. Frank Bow (R.-Ohio) of the Commerce Appropriations Subcommittee and by Rep. Carl Hinshaw (R.-Calif.), a member of the House Commerce Committee.

RTCA Reports on Warning Requirement

Washington—Radio Technical Commission for Aeronautics has distributed to its members an outline of the minimum operational requirements of a proximity warning system to reduce the hazard of mid-air collisions between aircraft.

Report was prepared by RTCA Special Committee 74, comprising more than 35 members of organizations representing all segments of the aviation industry concerned with air traffic control.

Minimum requirements provide that a warning be given to the pilot of the penetration by another aircraft of a protected volume of airspace. This is described by RTCA as horizontal airspace protection only over a radius of 10 miles surrounding the aircraft and vertical protection for 800 ft. above and below flight level at higher altitudes.

Requirements also specify reliability under all weather conditions, availability to all types of aircraft, simplicity of operation and accurate maintenance capabilities.

The report outlines requirements for more complex designs which will reduce the dimensions of the protected airspace in congested areas.

Copies of the report, Paper 112-56/DO 71 dated June 1, 1956, may be obtained from the RTCA for 20 cents each.

Braniff Issues Stock, Borrows $40 Million

Braniff Airways has arranged a $40 million long-term loan and a new issue of common stock to finance expansion of its fleet and ground facilities.

Braniff negotiated an agreement with a group of insurance companies which will make up to $40 million available to the carrier on a long-term basis. The funds may be used as needed through 1960, and the notes will mature in 1976.

The loan was negotiated through F. Eberstadt and Co. of New York.

The stock issue will be an offering of 1,105,545 common shares on a pro rata basis.

Present holders of common stock will be able to subscribe for the new shares on the basis of three new shares for each five held.

Braniff says the proceeds from the stock issue, along with the $40-million loan and current company funds, should be sufficient to finance its new equipment and facilities.

Braniff has ordered nine Lockheed Electras and five Boeing 707s for delivery in 1959 and 1960 and expects deliveries of seven DC-7Cs and five Convair Metropolitans to start this year.

The airline also is arranging for new facilities at Dallas to house its operations and maintenance base and its administrative headquarters.

Tacan-DME Controversy Sparks New Discussions, Contradictions

By L. L. Doty

Washington—The long-debated controversy over whether Tacan VOR/DME will be adopted as the nation's common navigation system was further clouded last week by these widely divergent views:

• **There is no longer any argument.** Rep. George Mahon, chairman of the Defense Appropriations Subcommittee, said he understood "an agreement . . . has been reached with the Civil Aeronautics Administration and with the Department of Defense." The CAA, he said, has agreed to accept the military's Tacan system.

• **No decision on Tacan** has been reached.

This was the statement made before the House Government Operations Subcommittee by Edward Curtis, presidential assistant for aviation facilities planning.

The same position was taken by Commerce Undersecretary Louis Rothschild during the subcommittee hearings. He added, however, that a decision should be made by Aug. 20 as to which type of distance measuring equipment will be used.

CAA Unconvinced

CAA officials told the subcommittee they are still unconvinced that Tacan could be made available by 1959, target date for jet transport operations. (The Air Force thinks it will be.) This conviction was shared by Milton Arnold, vice president of the Air Transport Association, who testified that further implementation of VOR/DME is the only means of obtaining distance measuring equipment within the next five years.

There was no sign of a give-and-take attitude by the Air Force. Major Gen. Kenneth Bergquist, USAF director of operations, told the subcommittee that "Tacan is now being produced on a broad basis, has been thoroughly tested and can be produced to meet civil high-performance aircraft requirements." Tacan, he said, is "by far the most economical both for the government and the civil aircraft operators."

Rothschild's apparent change in position was carried to the House floor by Rep. Sidney Yates (D.-Ill.). The Congressman quoted Rothschild as testifying last year that the Air Coordinating Committee "agreed unanimously that VOR/DME is still nationally and internationally approved distance-navigation equipment for common system use."

Yates said Rothschild also testified this year that it is not a "good expenditure of public funds to go out and operate more DME until there has been an indication that the industry needs it more than has been indicated up until now."

The Representative told the House that "witnesses from the CAA testified that DME would help unsnarl air traffic, directly contrary to Mr. Rothschild' statement."

Separate CAA Asked

Yates then called for a separation of CAA from the Commerce Department. He said, "We shall make more progress when we get rid of the confusion in the Department of Commerce, when we place the responsibility for a national airways system efficiently and safely operated in one person trained for the job."

The CAA five-year plan (see p. 40) also received its full share of attention during the House government operations subcommittee hearings now drawing to a close after hearing testimony for five weeks.

Gen. Bergquist testified that "air traffic control and rules of air governing air space use have not kept pace with the rapid expansion of military and civil aviation." He echoed earlier testimony by William Harding, former head of the Aviation Facilities Study Group, who told the subcommittee "the present traffic control system is obsolete and badly needs modernization."

Atlantic Coach Proposals Denied

Washington—The Civil Aeronautics Board last week rejected proposals by Trans American Airlines, Trans Caribbean Airways and U. S. Overseas Airlines for the operation of all-coach services across the North Atlantic.

The three non-scheduled airlines had asked the CAB for exemption authority to start transatlantic coach operations immediately. The Board said it was denying the proposals because the issues involved are too important to handle without "a full formal inquiry."

Trans American Airlines replied that the CAB's action assures "continued skyway robbery under control of an international cartel." Trans American wanted to begin its service on June 15.

The action marked the second time the CAB has refused Trans American an exemption for transatlantic coach service. The first application proposed a service between New York and London, Paris, Frankfurt and Rome with two flights a day at fares at about half those charged by scheduled carriers.

TCA Overseas Proposals

When the CAB rejected that plan, Trans American came back with a proposal to operate between the U. S. and Luxembourg. The airline said it had been granted full landing rights by the Luxembourg Government.

U. S. Overseas Airlines filed an application for the same type of service proposed by Trans American; Trans Caribbean Airways asked for authority to fly to points in Europe and the Middle East. Both carriers wanted immediate exemption authority pending a decision on their applications for certificates.

In turning the airlines down, the CAB said their applications produced no new evidence to persuade the Board it should change its policy against granting transatlantic operating authority without a full hearing and presidential approval.

Trans American Rebuttal

The Board also condemned Trans American's private negotiation of landing rights with the Luxembourg Government and pointed out that government policy forbids private agreements between airlines and foreign governments without prior approval of negotiations.

Trans American said its proposal gave the CAB its only real opportunity to "break the scandalous cartel-managed transatlantic fare structure and bring about the reductions it has expressed a desire for."

The airline said the recent fare change program approved at the International Air Transport Assn. meeting at Cannes did not cut fares by any significant amount and actually raised them in many cases.

Proximity Warning Devices To Be Studied by ATA

Air Transport Assn. is investigating ways and means of developing an aircraft proximity warning indicator for airline use. Development and installation of such a device is considered by ATA as needed "at the earliest possible date."

The association is naming a committee of airline representatives to take up the matter with electronic companies. After discussions with the electronics firms, the committee will recommend a course of action to ATA's board of directors.

Rush service to the top of the world!

On watch 24 hours a day, DEW (that's *D*istant *E*arly *W*arning) will probe the polar sky with radar. The DEW line will stand between *you* and a sneak attack over the top of the world.

Far north of any road or railroad, the DEW line depends on air transport for all supplies. Douglas transports, especially the C-124 Globemaster, handle the bulk of this assignment.

Big enough to swallow a tank, truck or a giant bulldozer. The C-124 moves cargo in quantity *so far and so fast* that logistics experts can plan smaller stockpiles—and less material en route in slower "pipelines." That results in stretching defense dollars farther. And the Douglas C-124 also doubles as a troop transport, hospital ship, repair shop or flying office.

Lifeline for the DEW Line—18th Air Force Douglas C-124

Development of the Douglas C-124 drastically simplifies supply problems. Specialists and material are never more than hours from any point on our defense perimeter. But good men are always needed. There's opportunity *for you* with the Air Force. Find out about it today!

Depend on ***DOUGLAS*** First in Aviation

Trans American Name Case Returned to CAB

Washington—Trans American Airlines' see-saw battle over its name moved back to the Civil Aeronautics Board with a court decision that the Board cannot prohibit the airline from using the name "American."

The U. S. Court of Appeals for the District of Columbia found that the CAB was within its authority in prohibiting the airline from calling itself by its former name of North American Airlines, but it ruled that the CAB prohibition against using the word "American" in any other name was too broad.

The case has been remanded to the Board for further findings on the use of the carrier's new name—Trans American Airlines. Both American Airlines and Trans World Airlines are objecting to the new name.

Trans American operated for several years as North American Airlines. North American Aviation and American Airlines each fought the non-scheduled airline up to the Supreme Court in an attempt to force a name change.

Last April, the Supreme Court sustained a lower court decision in favor of North American Aviation, and North American Airlines had to change its name to Trans American Airlines (AW May 7, p. 40).

The Court of Appeals decision upholding the CAB order directing the nonscheduled airline to stop calling itself North American was superfluous, since the Supreme Court action had already accomplished the same thing.

Douglas Backlog Up; DC-8 Costs Cut Net

Douglas Aircraft Co.'s backlog of commercial orders for 278 piston-powered transports and 114 DC-8 jet airliners reached a record high of $1.1 billion during the first half of the year. Total backlog was $2.4 billion.

Development costs, largely for the DC-8, increased from $5 million in the same period last year to $9.7 million this year and cut the company earnings, even though sales of $453 million for the first six months were above the $435 million for the period last year.

Net earnings for the first half this year were $12.8 million, or $3.46 a share, compared with $13.6 million, or $3.69 a share, last year. Deliveries of 26 four-engine commercial airliners in the second quarter increased earnings to $2.08 a share from $1.38 for the first quarter. Continued improvement is expected for the rest of the year, the company says.

Employment at the five Douglas divisions stands at 78,300. One of the divisions—Tulsa—was allocated $6.7 million in Air Force funds last week for facilities in support of the C-132 logistics transport problem. An engineering building to cost $3.1 million and a $200,000 plaster pattern shop will be built with the funds.

Construction of the engineering building is necessary because of the expansion of the engineering department, which for the first time has the responsibility and capability of designing its own airplane, the C-132, the company said.

Northwest Orient Expands Passenger Luxury Benefits

Northwest Orient Airlines, through a recently established customer service division of the company, is pushing for better passenger services. The new division is providing Northwest customers with such fringe benefits as chessboards and sake, the Japanese liquor.

Under the new setup, service responsibilities have been shifted to the central control of the division. The airline's station managers now are customer service managers and their former ramp, maintenance and hangar duties have been turned over, at larger stations, to the chief mechanic.

Customer service managers, their assistants, and some senior agents now are stationed in front of ticket counters at the larger stations to better assist passengers.

The new division also works up ideas for additional passenger comforts, some of them suggested by interviews with the customers. The chessboards and sake have been put aboard the airline's Orient flights as a result of customer demand.

Another plan is to send stewardesses to clinics presided over by beauty experts of a cosmetics firm. The girls will hear lectures on hair styling, grooming and makeup.

Other ideas include expanded interpreting service for Orientals arriving at U.S. points, baby strollers for mothers waiting for flights, and in-flight position charts to let passengers see where they are.

New Rules for Irregulars Asked

Washington—A set of qualifications for the approval of supplemental air carriers was proposed by a Civil Aeronautics Board counsel in the Large Irregular Air Carrier Investigation. Twenty-one carriers would qualify under the proposed rules.

CAB Bureau Counsel James L. Deegan made the proposals in his brief to the examiners in the final phase of the five-year-old Large Irregular Case. Deegan named the 21 irregular carriers he found qualified to become supplemental air carriers and rejected 33 others.

The final phase of the case deals with the qualifications of individual applicants for the new authority granted by the CAB last November in its policy decision in the case.

Deegan recommends that the Board judge individual carriers' qualifications by these criteria:

- **Sufficient financial resources** to provide a supplemental type of air service to the public.
- **Applicants guilty of serious violations** of the law or applicants whose officers have been guilty of serious violations should not qualify.
- **Carriers whose operating authority** has been revoked for violations of the law should not qualify.
- **Irregular carriers** that have not operated in 1955 or 1956 should not qualify.

The CAB counsel recommended that 11 irregular carriers should be refused authority to operate as supplemental carriers because they have operated in the past under various aircoach combines, including the Safetyway, Skycoach and North Star groups. Carriers in the North American group, now called Trans American Airlines, already have had their authority revoked and are appealing the decision in the courts.

Airlines which the Bureau counsel found qualified for supplemental carrier authority are:

American Flyers Airline Corp., Argonaut Airways Corp., Aviation Corporation of Seattle, Blatz Airlines, California Eastern Aviation, Capitol Airways, Coastal Cargo Company, General Airways, Johnson Flying Service, Los Angeles Air Service and Meteor Air Transport.

Also qualified were: Overseas National Airways, Quaker City Airways, Regina Cargo Airlines, Southern Air Transport, Standard Airways, Stewart Air Service, Trans Caribbean Airways, Transocean Air Lines, U. S. Overseas Airlines and World Airways.

Swissair Reservations Uses Automatic Telephone

New York—Swissair's reservations department is using an automatic telephone answering system which goes into operation when all lines are busy. A recorded message advises the caller of the tieup and asks for his name and phone number, which are taped so the call can be returned.

The device, supplied by the Bell system, measures about 12x14 in. and is 7 in. high.

ROLLS-ROYCE TO POWER
AMERICAN BUILT JET AIRLINERS

Trans-Canada Air Lines
have chosen

ROLLS-ROYCE
CONWAY

BY-PASS TURBO JETS

to power their
Douglas DC-8 airliners

ROLLS-ROYCE AERO ENGINES LEAD THE WORLD

CAB ORDERS

(July 5–11)

GRANTED:

Permission to intervene in the Seven States Area Investigation to the City of Duluth, Minn., and the Kansas City, Mo., Chamber of Commerce.

United Air Lines authority to suspend service at Grand Junction, Colo., until runways at Walker Field are adequate to accommodate DC-6 aircraft.

Permission to intervene in the New York-Florida Case to the Atlantic Coast Line, the Florida East Coast Railway, the Pennsylvania Railroad, the Richmond, Fredericksburg and Potomac Railroad and the Seaboard Air Line Railroad.

Caspar, Wyo., Chamber of Commerce permission to intervene in the Seven States Area Investigation.

Allegheny Airlines authority to suspend service at Asbury Park-Long Branch, Monmouth Beach, N. J., and an exemption to operate nonstop service between Atlantic City and New York/Newark until Feb. 11, 1959.

Flying Tiger Line an exemption to operate two round-trip transatlantic charter flights for International Research Fund, Inc. The Board reconsidered its earlier denial of the application.

Mohawk Airlines authority to suspend service at Auburn-Geneva, N. Y., from July 1, 1956, until airport facilities at the point are available. Mohawk has served the point through Sampson Air Force Base which was deactivated June 30, 1956.

APPROVED:

Control relationships between Arthur Vining Davis and Cutler Corp., providing no transactions for the sale, purchase or lease of aircraft between Cutler and Riddle Airlines or Mackey Airlines is entered without prior CAB approval. Davis must instruct Cutler to report on the first of March each year on transactions between Cutler and Mackey or Riddle if the transactions exceeded $20,000 during the year.

Control relationships between William Barnett, Norman Barnett, Alan Barnett, Barnett International Forwarders, Inc. and Barnett International Airfreight Corp., and interlocking relationships between Norman Barnett, Alan Barnett, Barnett International Forwarders, Inc. and Barnett International Airfreight Corp.

Agreements involving United Air Lines, Northwest Airlines and various other carriers relating to intercarrier arrangements.

Viscount 710 Air Stair

Retractable passenger stair is feature of newest Capital Airlines Viscount 710 recently received by the airline. Steps are operated by hydraulic system, fold up when aboard the airplane. Passenger loading on earlier Viscounts was handled through rear door.

ORDERED:

Investigation of 30-day local and joint round-trip, circle-trip and open-jaw trip excursion fares proposed by Braniff Airways for groups of two or more passengers.

Braniff Airways exemption authority to serve Miami as an intermediate point between Houston and Havana extended, providing Braniff serves Miami only on days when the Braniff-Eastern Air Lines interchange to South America is not operating. The authority is extended for a year or until a daily interchange service is provided.

DISMISSED:

Seaboard and Western Airlines application for an extension of its exemption authority to operate overseas cargo service, since the carrier has been granted a certificate since the application was filed.

BEA Reports Business Gain

London—British European Airways reports traffic increase in April and May of 15% "in spite of political disturbances in the Eastern Mediterranean which have affected BEA's most lucrative routes."

In the two months nearly 400,000 passengers were carried, 13% more than last year. Freight was up 31%.

	Months of April and May 1956	Months of April and May 1955	Variation
Capacity Ton: Miles Offered	22,568,000	19,148,000	+17.9%
Load Ton-Miles Sold	14,197,000	12,389,000	+14.6%
Revenue Load Factor	62.9%	64.7 %	−2.8%
Passenger Load Factor	68.7%	70.5 %	−2.6%
Passengers Carried	393,900	347,900	+13.2%
Passenger-Miles Flown	127,856,000	112,679,000	+13.5%
Freight Ton-Miles	1,420,000	1,086,000	+30.8%
Mail Ton Miles	530,400	542,700	−2.3%
Aircraft-Miles Flown	4,802,300	4,214,800	+13.9%
Revenue Hours Flown	27,967	26,217	+6.7%

AII Expected To Buy Two Boeing 707s

New Delhi, India—Air India International (AII) has announced it will place an order soon for at least two Boeing 707 jet airliners. The planes, to cost about $4.2 million each, will go into service between Bombay and London.

An announcement also is expected soon from the Indian Air Force for the purchase of about 40 Canberra jet bombers.

Negotiations are now taking place in London.

Brazilian Airline Pioneers New Routes

By Peter Weaver

Rio de Janeiro—A government-owned airline, Correio Aereo Nacional, is quietly carving out future markets for domestic and foreign carriers from the depths of the Brazilian jungle.

Forging into the interior as leader of Brazil's economic push to open its jungle regions, CAN last year carried without charge some 70,000 passengers and more than 2,000 tons of cargo.

While doing this, its aircraft flew 7 million route-miles in 40,000 hours of logged time over a 286,219-mi. system that extends into the heart of the Mato Grosso jungle and provides the only link between hundreds of raw-material-rich interior towns and coastal commercial centers.

CAN, operated for the government by the Brazilian air force, is reviving old river markets that have lain dormant since the collapse of the post World War I rubber boom and tapping new ones whose hopes rest primarily in oil and agriculture.

Prohibited by law from charging for most of its services, the government airline will step aside in favor of commercial carriers whenever one of its routes shows a profit-making potential.

New U. S.-Rio Route

The CAN system already has opened the way for a down-the-center route between the U. S. and Rio de Janeiro, a path airlines have avoided in the past because of the long stretches over inaccessible jungle and the lack of cargo and passengers anywhere within the interior of Brazil.

Focal point of the new down-the-center route is Manaus, an Amazon River port 1,300 air miles from Rio.

Largest of the Amazon's interior ports, the city dropped off to sleep at the end of the rubber boom. Now, under the impact of CAN, it is coming to life again.

The city's comeback as a business center has spurred Real-Aerovias into inaugurating DC-4 flights from Miami to Rio by way of Manaus, Campo Grande, Mato Grosso and Caracas. Panair do Brasil is providing daily Constellation service into Manaus from Rio and PBY service from Belem. Loide Aereo and Cruzeiro do Sul are offering mixed cargo-passenger service with C-46 and C-47 equipment.

Expansion Plans

If the passenger potential of Manaus increases still more, U. S. airlines may follow the lead of the Brazilian carriers. Braniff Airways, which currently prefers the more lucrative route along South America's west coast, already has Brazilian permission to use Manaus. The city lies in an almost direct line with Chicago, Miami, Caracas and Rio.

Over all its routes, CAN last year could have taken in $3 million (U. S.) if it had charged for the cargo and passengers hauled over its system. This year it will spend $5.6 million in expanding and consolidating its jungle complex.

It also will have to get at least 20% more mileage from its fleet if it is to keep up with the demand of the more than 600 cities and villages it serves.

To cover this staggering route system over some of Brazil's densest jungle, CAN last year employed 34 Douglas C-47s and nine Beech C-45s on a full-time basis. It also used, on a part-time basis, 40 C-47s, three C-46 gasoline tankers, 15 C-45s, six Lockheed Lodestars and 12 Fairchild C-82 Flying Boxcars.

CAN's penchant for carrying cargo and passengers without charge has stirred some public criticism from Brazil's commercial lines despite its pioneering efforts towards opening new routes. The criticism, however, is principally for the record.

Privately, airline executives admit that CAN absorbs "thousands of free loaders." These free loaders, for the most part are government employes who otherwise would buy commercial tickets for themselves, their families and servants at law-imposed discounts of from 25% to 50% and take up space now used by full-fare passengers.

The airline, formally established 25 years ago but lacking any real prominence until Brazil's drive to farm its interior was begun in earnest, also provides an economic and training boon for the Brazilian air force and other agencies. Among its benefits:

CAN Services

- **Transportation.** The line provides transport for military personel and their families. It also hauls missionaries and scientists into and out of the jungle.
- **Supply.** CAN ferries supplies into isolated areas for use by the Indian Protection Service and the Fundacao Brasil Central, an organization dedicated to interior exploration and development.
- **Mail.** Civilian mail automatically goes

Aviation Week Flys CAN

Correio Aereo Nacional recently invited Aviation Week on a 9,000 mile, 10-day flight to demonstrate what the airline is doing and how its impact is stimulating the economic progress of interior Brazil. The journey, over some of South America's thickest jungle, included visits to 22 cities and villages in 11 states and federal territories. This is the first of two articles on CAN's operations.

LANGUAGE, dialect, barriers sometimes call for demonstrating fueling instructions by drawing in sand. Most fueling is "roll-out-the-barrel" type (background).

TYPICAL jungle air strip at Xavantina, Matto Grosso, in heart of Xavante Indian country. River in background is Rio das Mortes (River of the Dead).

by CAN if the address is beyond the reach of commercial airlines. Government mail goes by CAN whenever possible.

Jungle Routes

In servicing the CAN routes, Brazilian air force pilots are often forced to squeeze their aircraft into small jungle-surrounded clearings hacked out by machete. Construction workers who built these airstrips in the malaria-infested areas (on one project, 109 of the 110 workers contracted the disease) were ferried to some of the sites by Indian canoe and light plane. At others they had to cut their way overland.

The more-isolated airfields are largely self-sufficient, with their own farms, maintenance shops and hydro-electric plants. Some are surrounded by Indian villages where peace is tenuously maintained on a "you leave us alone, and we'll leave you alone" basis. This system isn't always successful. An occasional airport worker is found in the bush, his body riddled by stone arrows.

But despite this, CAN is constantly expanding and consolidating its airfields, stimulating trade and opening the way for the Brazilian government to mine its potentially-profitable interior.

XAVANTE INDIANS shove C-47 of CAN out of rough spot on landing strip. Indians generally are friendly, still hunt with bow and arrow.

Shortlines

► **Allegheny Airlines** flew 7,063,317 passenger-miles last month, an increase of 17% over traffic for June, 1955. Traffic in the first six months was 29,472,000 passenger-miles, a 23% increase over the 1955 period.

► **Canadian Pacific Airlines** is offering a new fare which allows passengers to fly between New York and Mexico City via Toronto for the same fare charged by carriers on the direct New York-Mexico City route. Passengers make the Toronto-Mexico City trip on Canadian Pacific and connect with American Airlines or Trans Canada Airlines for the Toronto-New York trip.

► **Civil Air Transport Co. Ltd.** of Formosa and Eastern Air Lines have become active members of the International Air Transport Assn. Eastern has been an IATA member since 1945, but the carrier switched to active status when it took over Colonial Airlines' international operations June 1.

► **Delta Air Lines** started day coach operations between Houston, Washington and New York this month with a daily round trip Constellation service. Delta says its connection with Pan American World Airways at Houston provides the fastest coach service between New York and Mexico City operated by U.S. airlines.

► **Meteor Air Transport's** gross income in the first quarter was $517,919 as compared with $257,223 for the 1955 first quarter.

► **Seaboard and Western Airlines** flew 6,062,203 ton-miles of commercial freight during the first five months of the year, a 68% increase over the same period of last year.

► **Trans-Texas Airways** carried 19,976 passengers in June and 101,883 passengers during the first half of the year for increases of 43.4% and 34.8% respectively over the same periods of last year.

► **United Air Lines** flew 474,797,000 passenger-miles in June, a 21% gain over June, 1955. Freight ton-miles increased 14% in June, mail ton-miles were up 8% and express ton-miles gained 2%.

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While doing this, its aircraft flew 7 million route-miles in 40,000 hours of logged time over a 286,219-mi. system that extends into the heart of the Mato Grosso jungle and provides the only link between hundreds of raw-material-rich interior towns and coastal commercial centers.

CAN, operated for the government by the Brazilian air force, is reviving old river markets that have lain dormant since the collapse of the post World War I rubber boom and tapping new ones whose hopes rest primarily in oil and agriculture.

Prohibited by law from charging for most of its services, the government airline will step aside in favor of commercial carriers whenever one of its routes shows a profit-making potential.

New U. S.-Rio Route

The CAN system already has opened the way for a down-the-center route between the U. S. and Rio de Janeiro, a path airlines have avoided in the past because of the long stretches over inaccessible jungle and the lack of cargo and passengers anywhere within the interior of Brazil.

Focal point of the new down-the-center route is Manaus, an Amazon River port 1,300 air miles from Rio.

Largest of the Amazon's interior ports, the city dropped off to sleep at the end of the rubber boom. Now, under the impact of CAN, it is coming to life again.

The city's comeback as a business center has spurred Real-Aerovias into inaugurating DC-4 flights from Miami to Rio by way of Manaus, Campo Grande, Mato Grosso and Caracas. Panair do Brasil is providing daily Constellation service into Manaus from Rio and PBY service from Belem. Loide Aereo and Cruzeiro do Sul are offering mixed cargo-passenger service with C-46 and C-47 equipment.

Expansion Plans

If the passenger potential of Manaus increases still more, U. S. airlines may follow the lead of the Brazilian carriers. Braniff Airways, which currently prefers the more lucrative route along South America's west coast, already has Brazilian permission to use Manaus. The city lies in an almost direct line with Chicago, Miami, Caracas and Rio.

Over all its routes, CAN last year could have taken in $3 million (U. S.) if it had charged for the cargo and passengers hauled over its system. This year it will spend $5.6 million in expanding and consolidating its jungle complex.

It also will have to get at least 20% more mileage from its fleet if it is to keep up with the demand of the more than 600 cities and villages it serves.

To cover this staggering route system over some of Brazil's densest jungle, CAN last year employed 34 Douglas C-47s and nine Beech C-45s on a full-time basis. It also used, on a part-time basis, 40 C-47s, three C-46 gasoline tankers, 15 C-45s, six Lockheed Lodestars and 12 Fairchild C-82 Flying Boxcars.

CAN's penchant for carrying cargo and passengers without charge has stirred some public criticism from Brazil's commercial lines despite its pioneering efforts towards opening new routes. The criticism, however, is principally for the record.

Privately, airline executives admit that CAN absorbs "thousands of free loaders." These free loaders, for the most part are government employes who otherwise would buy commercial tickets for themselves, their families and servants at law-imposed discounts of from 25% to 50% and take up space now used by full-fare passengers.

The airline, formally established 25 years ago but lacking any real prominence until Brazil's drive to farm its interior was begun in earnest, also provides an economic and training boon for the Brazilian air force and other agencies. Among its benefits:

CAN Services

- **Transportation.** The line provides transport for military personel and their families. It also hauls missionaries and scientists into and out of the jungle.
- **Supply.** CAN ferries supplies into isolated areas for use by the Indian Protection Service and the Fundacao Brasil Central, an organization dedicated to interior exploration and development.
- **Mail.** Civilian mail automatically goes

LANGUAGE, dialect, barriers sometimes call for demonstrating fueling instructions by drawing in sand. Most fueling is "roll-out-the-barrel" type (background).

Aviation Week Flys CAN

Correio Aereo Nacional recently invited Aviation Week on a 9,000 mile, 10-day flight to demonstrate what the airline is doing and how its impact is stimulating the economic progress of interior Brazil. The journey, over some of South America's thickest jungle, included visits to 22 cities and villages in 11 states and federal territories. This is the first of two articles on CAN's operations.

TYPICAL jungle air strip at Xavantina, Matto Grosso, in heart of Xavante Indian country. River in background is Rio das Mortes (River of the Dead).

by CAN if the address is beyond the reach of commercial airlines. Government mail goes by CAN whenever possible.

Jungle Routes

In servicing the CAN routes, Brazilian air force pilots are often forced to squeeze their aircraft into small jungle-surrounded clearings hacked out by machete. Construction workers who built these airstrips in the malaria-infested areas (on one project, 109 of the 110 workers contracted the disease) were ferried to some of the sites by Indian canoe and light plane. At others they had to cut their way overland.

The more-isolated airfields are largely self-sufficient, with their own farms, maintenance shops and hydro-electric plants. Some are surrounded by Indian villages where peace is tenuously maintained on a "you leave us alone, and we'll leave you alone" basis. This system isn't always successful. An occasional airport worker is found in the bush, his body riddled by stone arrows.

But despite this, CAN is constantly expanding and consolidating its airfields, stimulating trade and opening the way for the Brazilian government to mine its potentially-profitable interior.

XAVANTE INDIANS shove C-47 of CAN out of rough spot on landing strip. Indians generally are friendly, still hunt with bow and arrow.

Shortlines

▶ **Allegheny Airlines** flew 7,063,317 passenger-miles last month, an increase of 17% over traffic for June, 1955. Traffic in the first six months was 29,472,000 passenger-miles, a 23% increase over the 1955 period.

▶ **Canadian Pacific Airlines** is offering a new fare which allows passengers to fly between New York and Mexico City via Toronto for the same fare charged by carriers on the direct New York-Mexico City route. Passengers make the Toronto-Mexico City trip on Canadian Pacific and connect with American Airlines or Trans Canada Airlines for the Toronto-New York trip.

▶ **Civil Air Transport Co. Ltd.** of Formosa and Eastern Air Lines have become active members of the International Air Transport Assn. Eastern has been an IATA member since 1945, but the carrier switched to active status when it took over Colonial Airlines' international operations June 1.

▶ **Delta Air Lines** started day coach operations between Houston, Washington and New York this month with a daily round trip Constellation service. Delta says its connection with Pan American World Airways at Houston provides the fastest coach service between New York and Mexico City operated by U.S. airlines.

▶ **Meteor Air Transport's** gross income in the first quarter was $517,919 as compared with $257,223 for the 1955 first quarter.

▶ **Seaboard and Western Airlines** flew 6,062,203 ton-miles of commercial freight during the first five months of the year, a 68% increase over the same period of last year.

▶ **Trans-Texas Airways** carried 19,976 passengers in June and 101,883 passengers during the first half of the year for increases of 43.4% and 34.8% respectively over the same periods of last year.

▶ **United Air Lines** flew 474,797,000 passenger-miles in June, a 21% gain over June, 1955. Freight ton-miles increased 14% in June, mail ton-miles were up 8% and express ton-miles gained 2%.

Now Available...

FIRST HF TRANSISTORS

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Army Signal Corps Standards

A wide variety of military equipment, once impossible to transistorize due to frequency limitations of available transistors, is now being developed with Philco Surface Barrier Transistors.

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- Absolute hermetic seal
- Meet MIL-T-12679A Military requirements

Now available for large volume military and industrial applications . . . the high frequency Philco Surface Barrier Transistors that were developed for the Army Signal Corps to meet the stringent requirements of field use in military electronics equipment. Advanced precision techniques used in fabricating the Philco Surface Barrier Transistors make possible rigidly controlled automatic manufacture with its resultant uniformity, reliability and high volume production. These reliable transistors point the way to new fields in transistorization. Make these reliable high frequency Philco Surface Barrier Transistors part of your forward looking plans.

For complete technical information on these High Frequency transistors write Dept. AW-3, LANSDALE TUBE CO., Lansdale, Pa. A DIVISION OF PHILCO CORP.

PHILCO CORPORATION

LANSDALE TUBE COMPANY DIVISION

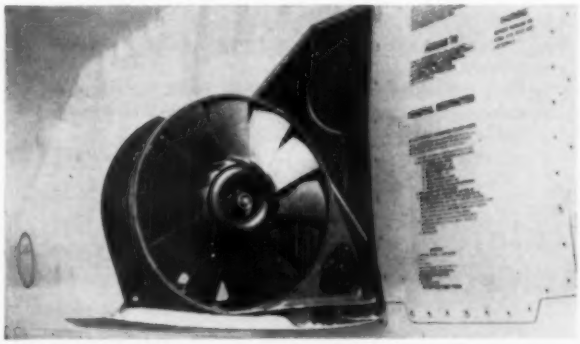
LANSDALE, PENNSYLVANIA

VOUGHT CRUSADER F8U-1 sits next to air-transportable ground servicing unit which can be carried on an underwing pylon.

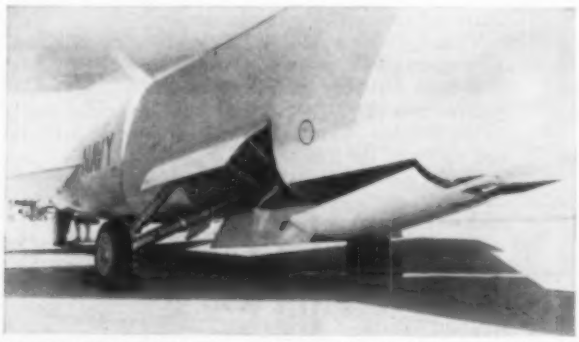
Special Crusader Details

SHARP-EDGED JOWL inlet gulps air for the P&WA J57; protruding nose cone above forces diagonal shock in supersonic flight.

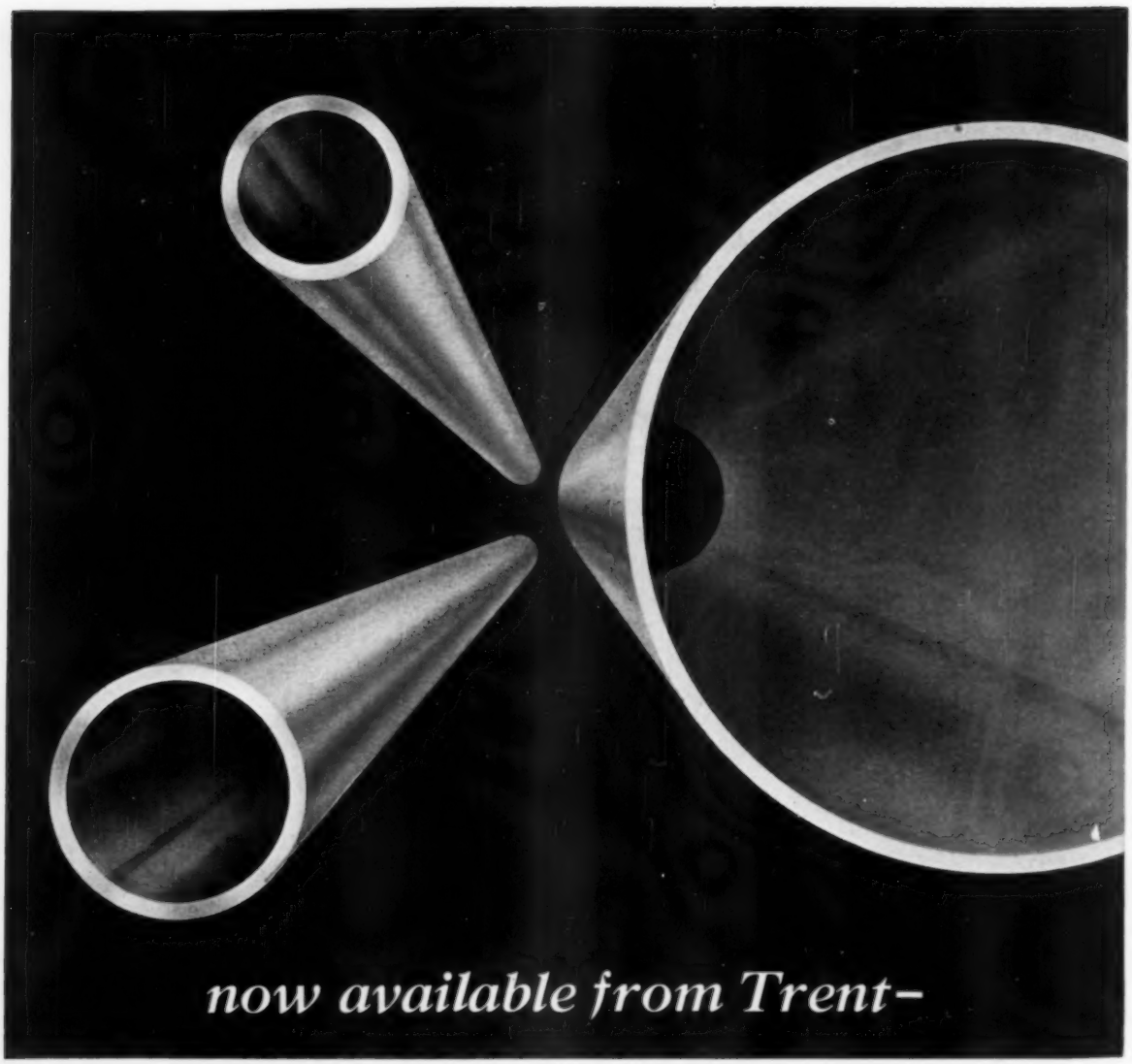
FLAMEHOLDER of J57 afterburner has four annular rings, increases thrust of powerplant for takeoff and supersonic dash performance.



RAM-AIR TURBINE mounts on side of F8U for emergency power in event of engine failure. Unit is normally retracted.



SPEED BRAKE is belly-mounted ahead of main landing gear doors. Gear has wide tread, considering its fuselage location.



Titanium Tubing

For processing lines carrying fluids of an extremely corrosive nature — look to *Contour Trentweld* titanium tubing for reliable service.

This titanium tubing is completely uniform throughout any cross-section. The weld zone is free from bulging weld bead because Trent's exclusive process — performed with the weld area at the bottom — forms the molten weld metal into the shape of the tubing.

And, with titanium, you get the unique advantages of a tubing that's strong as steel but 44% lighter . . . virtually immune to a broad spectrum of corrosive materials . . . entirely free from stress-corrosion cracking.

So, next time you need a strong, light, extremely corrosion-resisting tubing—try *Contour Trentweld* titanium tubing. And remember, it's made by Trent — tube mill specialists.

CONTOUR TRENTWELD

Stainless and High Alloy Welded Tubing

TRENT TUBE COMPANY, GENERAL SALES OFFICES, EAST TROY, WISCONSIN (Subsidiary of Crucible Steel Company of America)

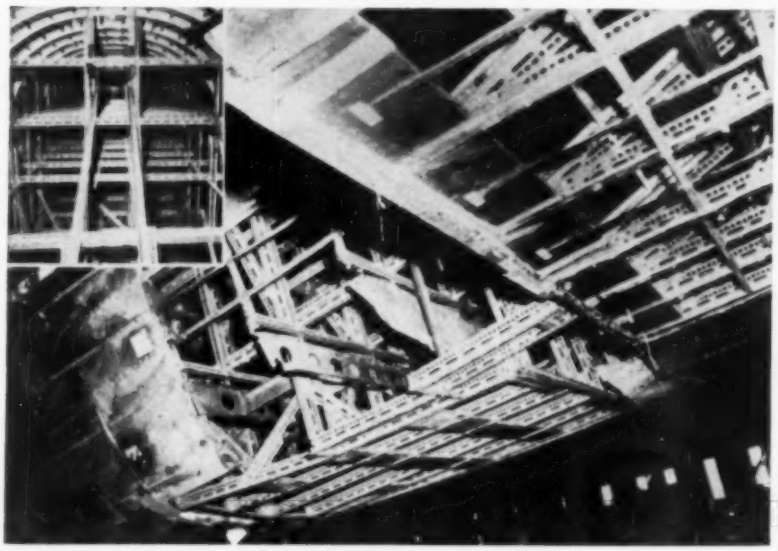
Emergency Fix for Bomb Damage

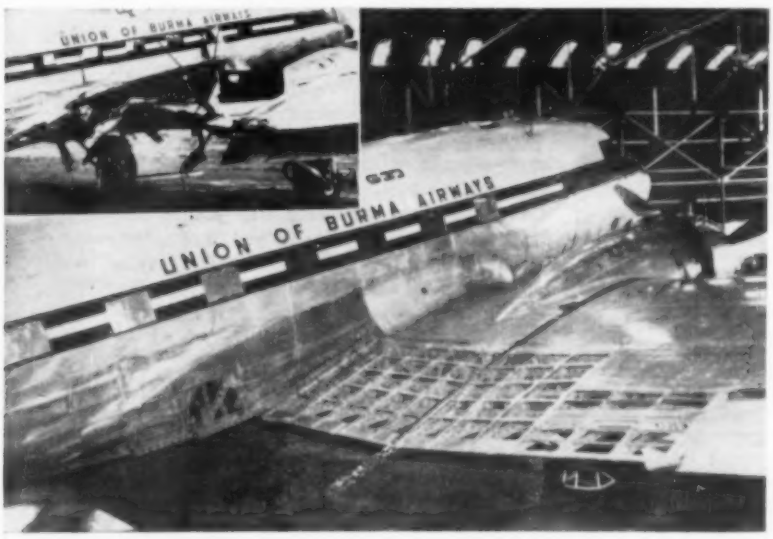
Rangoon, Burma—An emergency fix resembling something put together with a toy erector set was used to make a bomb-damaged DC-3 flyable in this strife-torn southeast Asian country.

Standardized slotted steel L-sections ordinarily used for temporary construction of light, earthbound frames were used to replace much of the wing and fuselage structure torn away or damaged by the blast of a land mine. The mine apparently was exploded manually by Burmese or Chinese terrorists as the Union of Burma Airways DC-3 touched down at a small airfield about 400 miles north of Rangoon on the Irrawaddy River. The charge exploded directly under the airplane, tearing away the aft part of the right wing center section, ripping a hole in the bottom of the fuselage, and distorting the entire airframe including the tip of the vertical fin. The explosion made scrap of both wing tips. The pilot was able to control the airplane and bring it to a safe stop without any further damage.

There were not adequate facilities on the field for a complete overhaul and surface transportation in the area was too primitive to carry the airplane back to a repair base. The airplane had to be flown out or written off.

An engineer from Hong Kong Aircraft Engineering Co. Ltd. surveyed the damage and decided to straighten





DISTORTED BY BLAST, the airframe (above) of UBA DC-3 had to be reinforced for fly-out. Center section trailing edge (below) was replaced by stock slotted L-sections.

PUMP PRIMERS

GEROTOR . . .
"the aircraft pump that couldn't be built" . . .

Recognized as an extremely attractive theoretical design 30 years ago, there were many abortive attempts to produce Gerotor pumps.

Since then, the W. H. Nichols Company of Waltham, Mass. has built hundreds of thousands of Gerotor pumps for aircraft, marine and industrial applications requiring the highest standards of performance and dependability.

▸ **Advantages** – *The Gerotor pump is a positive displacement type, delivering a predetermined amount of fluid in direct proportion to speed. It is simple and compact in basic design, (only 2 moving parts) lightweight, valveless, provides high volumetric and mechanical efficiency and offers exceptional performance at high altitudes where low inlet pressures are encountered.*

▸ **Operating cycle** – The Gerotor pump is a form of internal gear pump in which the inner element *always has one less "tooth"* than the outer. Both turn in the same direction. The volume of the missing tooth multiplied by the number of driver teeth is the volume of fluid pumped per revolution. Either the inner or outer Gerotor can be driven.

The Gerotors are mounted on fixed centers eccentric to each other. As they turn, the chamber between the teeth of the inner and outer Gerotor gradually increases in size through the initial 180° of revolution until it reaches the full volume of the missing tooth.

During this first half-revolution, the gradually enlarging chamber passes the intake port, creating a partial vacuum into which liquid from the port flows.

In the second 180° the teeth mesh, decreasing the size of the chamber as it passes the discharge port, forcing the liquid out.

▸ ***Technical Data*** – *is available and your inquiry is invited. Write:*

FIG. 1

W. H. NICHOLS CO.
48 Woerd Avenue, Waltham 54, Massachusetts

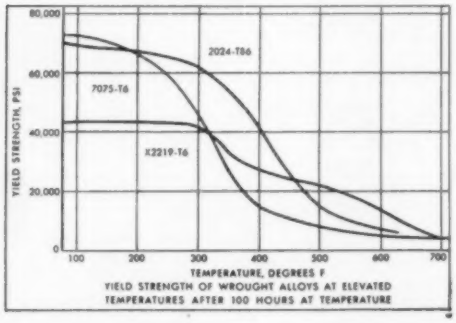
Wing skins of a new Alcoa alloy solve the aerodynamic heating problem in the F-102A.

Alcoa® develops new alloys to break the speed-heat barrier

At today's supersonic speeds, aircraft skin temperatures approach 400° F due to aerodynamic heating. Engines, de-icers, etc., add more heat so that some aircraft structural members now reach 600° —and even higher in missiles.

These high temperatures cause conventional aircraft aluminum alloys to "creep" or slowly deform under stress. To lick the problem, Alcoa has been developing new alloys which behave like many good fighting men: they really shine when the heat is on.

The chart below shows the yield strengths of three alloys at various temperatures. Alloy 7075-T6 is an old favorite for airframe structural members, and at low temperatures it's tops. Note, however, that when the temperature begins to rise its yield strength falls off quite rapidly. On the other hand, alloy 2024-T86 starts off in second place but comes into its own in the 300 to 400° range. This alloy is now used for the F-102 wing skin to withstand aerodynamic heating.



YIELD STRENGTH OF WROUGHT ALLOYS AT ELEVATED TEMPERATURES AFTER 100 HOURS AT TEMPERATURE

The real sleeper is experimental alloy X-2219, the strongest of all commercially available alloys in the 500 to 600° temperature range. With speeds constantly going up, X-2219 should have an important place in airframe structural members and engine parts.

Can Alcoa's vast experience and facilities help solve a light metals problem for you? Let us help you imagineer for the nation's defense . . . in Alcoa Aluminum. Aluminum Company of America, 1800-G Alcoa Building, Pittsburgh 19, Pa.

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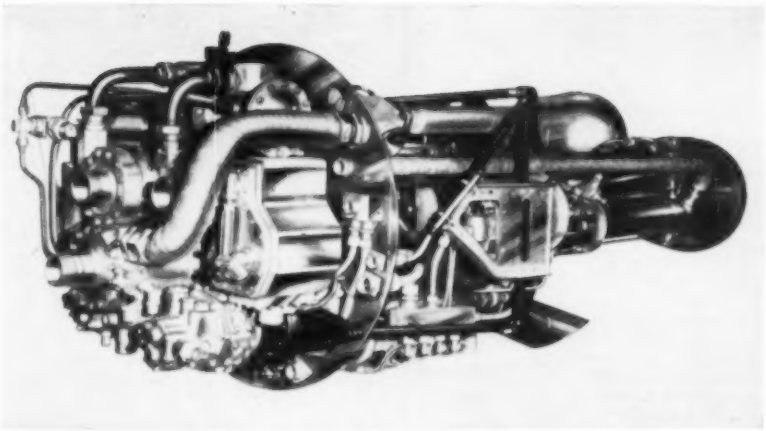

British Rocket: Screamer

Thrust increasing from 8,000 lb. at the surface to 9,500 lb. at 40,000 ft. is credited to this liquid-oxygen-and-parafin burning rocket engine. Manufacturer—Armstrong Siddeley—calls it the Screamer. Single unit is 28 in. in diameter, 78 in. long and weighs 470 lb. When first tested in 1954 as successor to the 2,000-lb.-thrust Snarler, the Screamer developed only 4,000 lb. thrust, which has since increased. It can be used with an ordinary jet turbine or independently. Another British rocket engine, the Napier Scorpion NSC.1, using liquid propellents, is being tested in a Canberra belly installation.

and reinforce the damaged structure with a jury rig made of perforated angle iron designed and fabricated by Dexion Ltd. of London and bolted together with standard AN-3 and AN-7 bolts.

The bolt slots in the angle sections make it possible to assemble a frame quickly without extensive cutting and drilling, using only hand tools.

In Hong Kong the structure was designed and stressed, built into position in another DC-3 used as a mock-up, marked, numbered and dismantled to be flown to the airstrip in Burma. It used 2,200 ft. of angle section and 2,400 bolts.

The center section structure made use of wooden formers bolted to the steel frame. The repaired part of the center section was fabric covered and the airplane had to be flown without flaps.

It was properly contoured and aerodynamically clean. No trim was required in straight and level flight.

Installation at the Burma airstrip was carried out under military guard as terrorists were believed to be in the area.

When the work was complete the DC-3 was flown approximately 1,400 miles to Hong Kong for permanent repair. Rough air was encountered and one landing was made en route at Rangoon.

Boeing 707 Tests for USAF Nearing End

Seattle, Wash.—Flight test time contracted by the USAF on the Boeing 707 jet transport is nearing completion. The 707 prototype, basic airplane of the USAF KC-135 jet tanker, made its first flight July 15, 1954 and completed its 500th hour in the air last week. That leaves less than 65 hours remaining of the test time contracted for by USAF as part of KC-135 program.

Present series of tests will last until about Aug. 1, Boeing says.

In addition to experimental flying in support of the KC-135 program, the airplane is being used for tests in connection with commercial jet transport.

USAF Awards Solar Compressor Contract

Solar Aircraft Company has received an Air Force contract of $2,456,417 for MA-2 Jupiter gas turbine powered compressors. The new contract supplements earlier development, testing and production contracts aggregating more than $7.5 million. Production of the gas turbine units will be in Solar's San Diego plant.

The compressor packages will be installed in multi-purpose vehicles using air bleed to start aircraft engines and drive airplane air conditioning units. The gas turbine engine is a 500 hp. unit originally developed for the Navy. A constant speed version is used in shipboard generator sets and a variable speed version is now being tested as a marine propulsion unit for a 40-ft. personnel boat.

Contracts totaling over $2.6 million have also been received by Solar for airborne generator sets powered by Solar's smaller unit, the 50 hp. Mars gas turbine. The contracts are from USAF and the Boeing Airplane Co. The auxiliary

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The Laboratory is primarily concerned with research and development of guided missile systems. A sizeable program of fundamental research is concurrently in progress.

APL is responsible for technical direction of the Navy's Bumblebee guided missile program. Developments at APL include the first supersonic ramjet, and the missiles TERRIER, TALOS and TARTAR.

A distinguishing feature of the Laboratory is the self-dependence of the professional staff members, who work in an atmosphere of free inquiry and are unhampered by the usual administrative details. Problems are attacked by teams, each of which maintains a fine balance between research and engineering. The team approach allows each member to acquire broad knowledge, find his creativity heightened.

The locations of the Laboratories in the Washington D. C.-Baltimore periphery place staff members near fine housing in all price ranges, recreational and cultural facilities. Moving expenses paid in full. Liberal educational benefits for study at a number of excellent universities nearby.

OPENINGS EXIST IN:

DEVELOPMENT: stability and control analysis; ramjet engine design

RESEARCH: interference and heat transfer phenomena; hypersonics, turbulence, shock wave phenomena

For additional information write:
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NEW ISSUE

July 10, 1956

2,570,846 Shares

Sperry Rand Corporation

Common Stock

(Par Value 50¢ Per Share)

Holders of the Company's outstanding Common Stock are being offered the right to subscribe at $20.50 per share for the above shares at the rate of 1 new share for each 10 shares held of record July 9, 1956. Subscription Warrants will expire at 3:30 P.M., Eastern Daylight Saving Time, on July 25, 1956.

The several Underwriters have agreed, subject to certain conditions, to purchase any unsubscribed shares and, both during and following the subscription period, may offer shares of Common Stock as set forth in the Prospectus.

The Prospectus may be obtained in any State in which this announcement is circulated from only such of the undersigned or other dealers or brokers as may lawfully offer these securities in such State.

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The First Boston Corporation — **Hornblower & Weeks** — **Eastman, Dillon & Co.**

Glore, Forgan & Co. — **Goldman, Sachs & Co.** — **Harriman Ripley & Co. Incorporated**

Kidder, Peabody & Co. — **Lazard Frères & Co.** — **Smith, Barney & Co.**

Stone & Webster Securities Corporation — **Union Securities Corporation**

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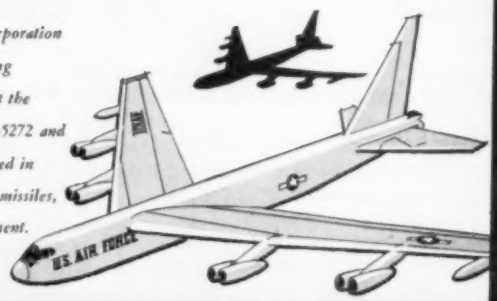
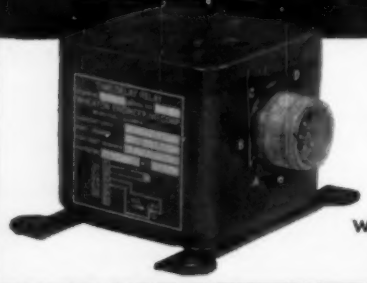
Wheaton Engineering Corporation Electro-Mechanical timing devices are designed to meet the requirements of MIL-E-5272 and MIL-R-6106B. They are used in many aircraft, guided missiles, and other airborne equipment.



WEC® TIME DELAY RELAY used on Boeing B-52 Stratofortress



We invite inquiries on your timing problems.

WHEATON ENGINEERING CORPORATION

930 MANCHESTER ROAD · WHEATON, ILLINOIS

generators will be installed in the Boeing KC-97 tanker. The Boeing contract covers installation kits.

Mars-powered generators are also being used in the Douglas C-124C, the Lockheed C-121C and the Convair C-131B. The turbine also powers portable fire pumps and other pieces of equipment.

Navy Inaugurates Two Pacific Radar Squads

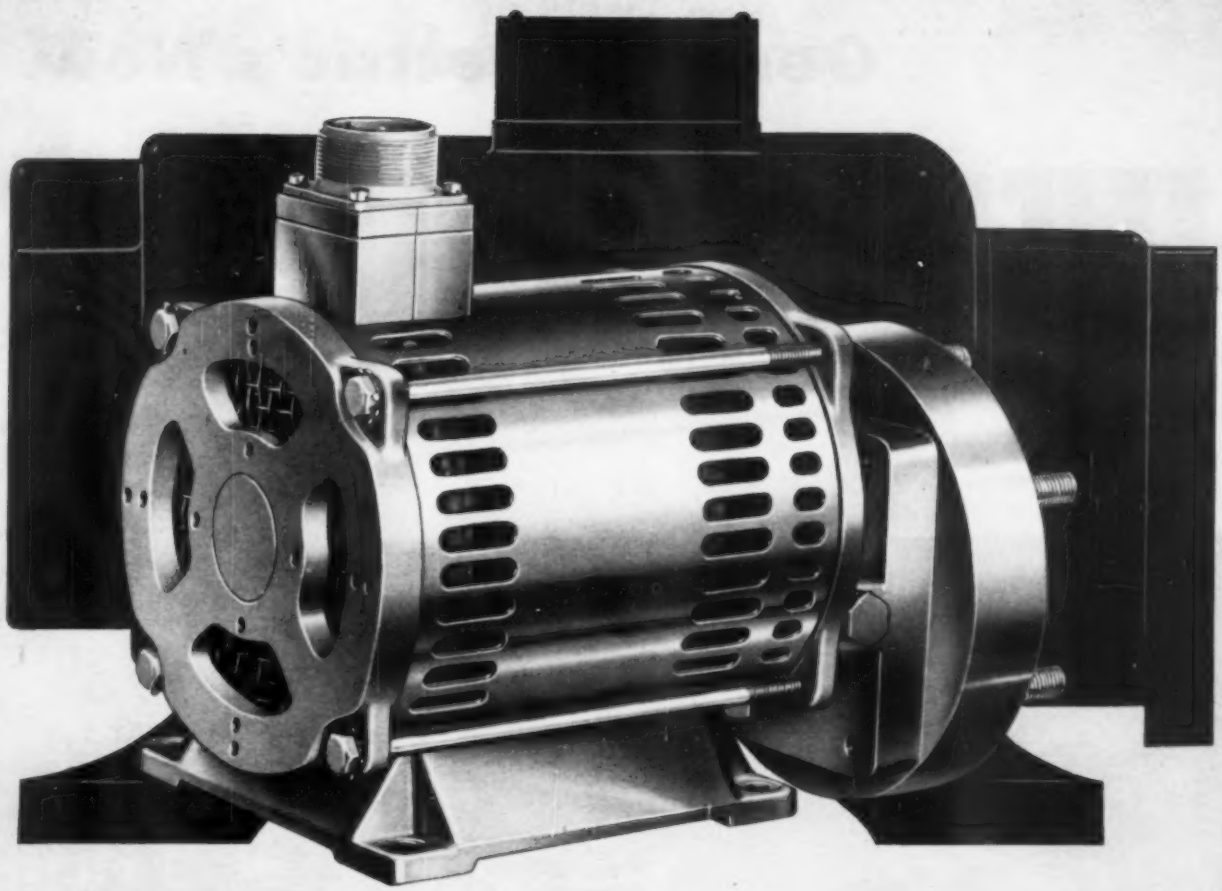
Pacific extension of DEW line went into operation with inauguration of two all-new Navy squadrons of WV-2 Super Constellations carrying radar detection equipment.

Similar Navy outfits are conducting surveillance in the North Atlantic. New squadrons will watch from Alaska to Hawaii for air invaders.

Navy estimates new Pacific DEW line extension represents over-all investment of more than $300 million in aircraft, equipment and base facilities.

Cool at 1,200F

Fabric flares up in 1,200F temperature of a ceramic box furnace but the man in the Fyrepel suit remains cool. D. J. Bennett entered the fiery furnace six times to stay for two or three minutes. One time he carried an armload of wood which burst into flames; on another trip he sat in a wicker chair which burned out from under him. Last trip was with a steak which was cooked in less than two minutes to medium-rare. Bennett didn't even get warmed over. The suit is made from a Fiberglas material backed with Fiberglas quilting which is faced with a layer of aluminum. It has been evaluated in more than 2,000 garments in 100 plants. Maker of this particular suit is Fyrepel Products, Inc., Newark, Ohio.



CUSTOM DESIGN OF G-E AIRCRAFT MOTOR CUTS MOTOR WEIGHT 45% AT 22% LESS COST

Ordinarily, custom design is costly. Sometimes it isn't even necessary. But here is one example of how G-E custom aircraft motor design not only improved motor suitability but also substantially reduced cost to customer.

Two motors were submitted for a customer's application. Both motors performed satisfactorily. But the G-E motor weighed 45% less and cost 22% less than the other motor shown by the silhouette! The reason: as with most G-E aircraft motors, the motor above was specially designed—for this one application.

This is another example of the design service offered by G-E aircraft motor engineers—specialists in designing motors to meet rigid size and operating requirements in aircraft and missile applications.

Expert application assistance in aircraft motors is backed up by advanced design features, outstanding testing laboratories, and modern manufacturing facilities—all adding up to on-time delivery of the right G-E aircraft motor for your application.

Contact your local G-E Apparatus Sales Office for prompt attention. Section 634-4, General Electric Co., Schenectady 5, New York.

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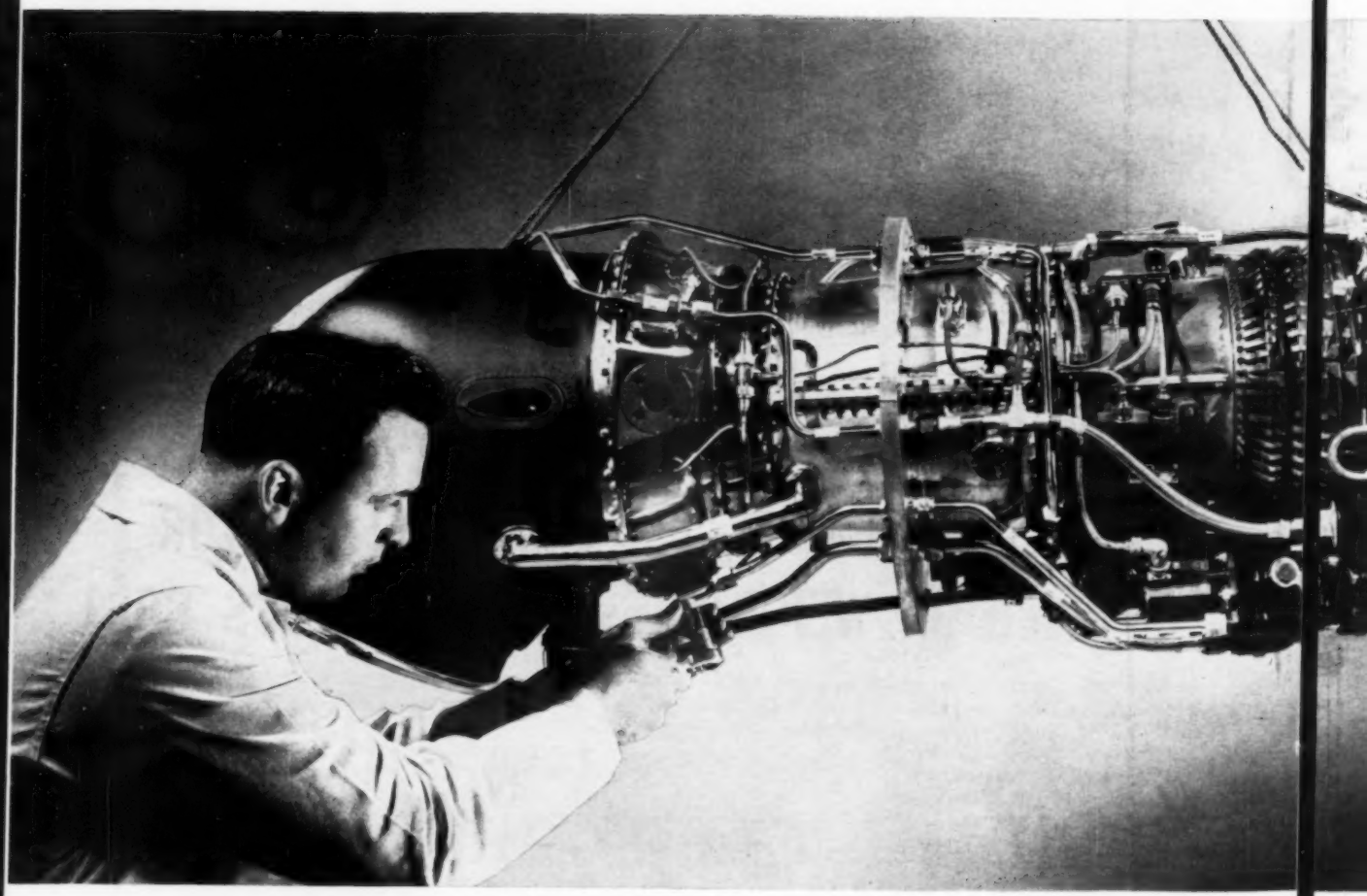
General Electric's New

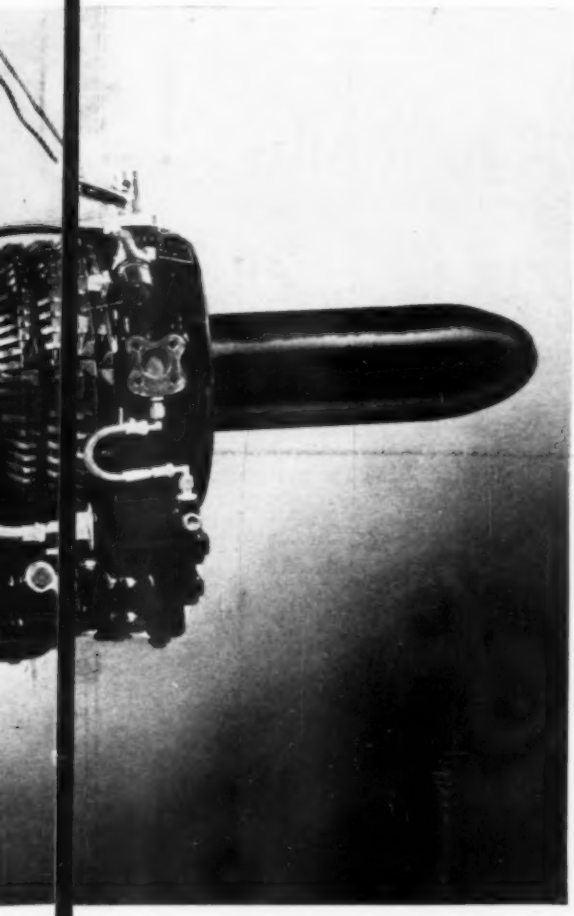
WEIGHS 250 LBS



THE T58 is a high-performance, axial-flow gas turbine engine. In helicopters, the T58's new constant-speed engine control and free power turbine will greatly simplify pilot duty and permit operation of the helicopter's rotor at its maximum efficiency.

T58 Turboshaft Engine

DELIVERS 1050 HP



specific fuel consumption — 0.67 normal
specific engine weight — 0.24 lb/hp
overall engine length — 55 inches
diameter at maximum flange — 16 inches

General Electric's T58 turboshaft engine is "power in a small package." Power for helicopters, convertiplanes, and tomorrow's small aircraft.

With a power-weight ratio of more than four to one—fuel consumption rivalling a reciprocating engine's—the T58 introduces an era of outstanding small aircraft performance and operating economy.

New standards of speed, range, and payload will follow the T58 wherever it flies. Easy maintenance, long operating life, installation flexibility—these, too, are inherent by-products of the T58's advanced design.

The T58 was designed and developed for the U.S. Navy by General Electric's Small Aircraft Engine Department in Lynn, Mass. It is further evidence of G.E.'s skill and experience in the art of aircraft gas turbine design.

Find out what the T58's many features can mean to your aircraft. Call your General Electric Aviation & Defense Industries Sales Office or write: General Electric Company, Section 233-2, Schenectady, N. Y., for the T58 descriptive bulletin.

All figures are based on engine without helicopter reduction gear. Gear weight: 75 lbs.

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SAVE 10 LBS.,

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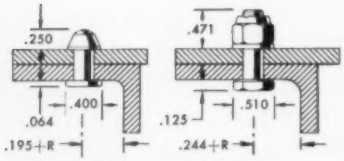
In weight comparison between HI-SHEARS and high strength close tolerance bolts, per thousand pieces and using a ¼" diameter—⅜ grip length—4650 lbs. shear, the bolt-nut-washer weight is almost double that of HI-SHEARS.

HS52P-8-6	Steel Hi-Shear Pin	9.25
HS15-8	Alum. Hi-Shear Collar	1.32
		10.57 lbs.

NAS464P4A7	Steel Bolt	17.35
AN365D428	Alum. Nut	3.40
AN960PD416L	Alum. Washer	.90
		21.65 lbs.

Even substituting a 40% lighter titanium bolt for the steel bolt, the bolt-nut-washer combination is still heavier than the HI-SHEAR by 4.14 lbs. per thousand pieces.



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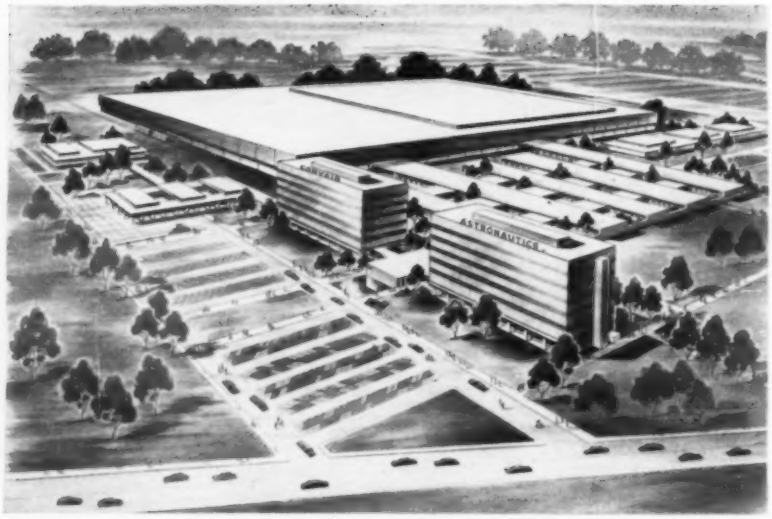


ATLAS intercontinental ballistic missile will be built at $40-million plant northeast of San Diego, Calif. Six-story office buildings (foreground) are for engineering (left) and administration (right). Laboratory facilities at rear are in waffle pattern, the light wells separating individual structures. One-story high bay factory building in background will provide 500,000 sq. ft. of floor space. Completion will be in 1957.

Plant Layout Settled for Atlas

San Diego, Calif.—Convair's new Montgomery Field plant for the $40 million Atlas intercontinental missile (AW May 7, p. 31) will be known as Convair-Astronautics.

In addition to research, development, manufacturing and testing of the missile, the plant ultimately will house the laboratories and offices of Convair's new Department of Scientific Research headed by Dr. Charles R. Critchfield.

Joseph T. McNarney, Convair president, said last week that the new $40 million facility, to be completed next year, will be paid for by the company with the exception of special equipment and machine tools provided by the USAF.

The plant will consist of a one-story high-bay factory of about 500,000 sq. ft.; two six-story office buildings, each containing approximately 107,000 sq. ft.; a 147,000 sq. ft. engineering laboratory; a cafeteria-auditorium, and other buildings. Total floor area will be about one million sq. ft.

Until the new plant is completed in late 1957, work on Atlas will continue at Convair's San Diego 1 plant. J. R. Dempsey is director of the program.

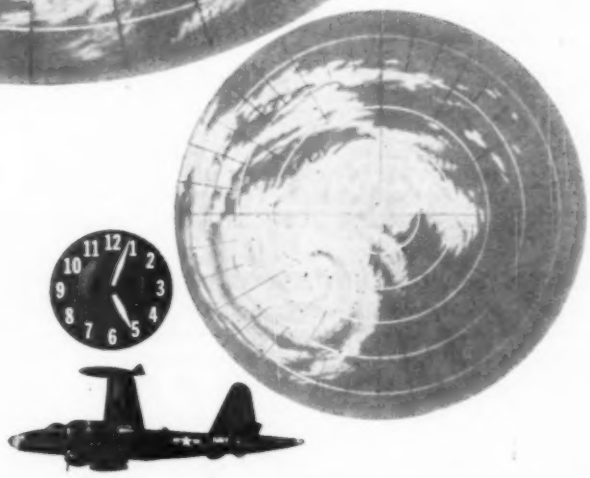
Construction will begin later this summer at the site approximately eight miles from the center of San Diego.

Rotor Power Experiment

Preliminary tethered runs are under way for the Hunting-Percival P-74 helicopter. Designed to develop form of rotor power, the P-74 is powered by two Napier Oryx gas generators and has a pressure-jet-driven rotor.

Evil Eye of a Caribbean Killer

Deadly hurricanes —tracked on radar scopes— are thwarted by early warnings from Lockheed/Navy Neptunes



Newly perfected techniques of radar-scope photography provide timed photographs showing size and shape of hurricanes as they form, move along their trajectory and dissolve. These photos provide invaluable reference data for weather experts and forecasters.

Undaunted by howling winds and raging seas from which most planes flee or take cover, P2V *Neptunes* deliberately fly into hurricanes —encountering violent turbulence, savage updrafts and downdrafts, and shear-forces of awesome destructiveness. Boring into the very eye of Caribbean killer-storms, the *Neptune's* Navy pilots and crew plot each hurricane's position and path, temperature, humidity, and pressure—and transmit this data to Fleet Weather Central, Miami.

Each year these advance warnings save hundreds of lives and millions of dollars in ships and property—thanks to the ruggedness of P2V *Neptunes* and to the workaday valor of the Navy's "Hurricane Hunters."

For a decade the multi-mission P2V has repeatedly proved its ability to go anywhere when the going's toughest—in Arctic blizzards or tropic heat. As flying weather bureau, long-range search plane and deadliest of sub hunter-killers, the P2V is in a class by itself.

The versatility of the *Neptune* is characteristic of all Lockheed-designed planes. And the 24 contracts awarded Lockheed by the Navy for improved versions of the P2V are a tribute to the inherent longevity of the *Neptune*—and to Lockheed's leadership in the design and production of all-weather patrol aircraft.

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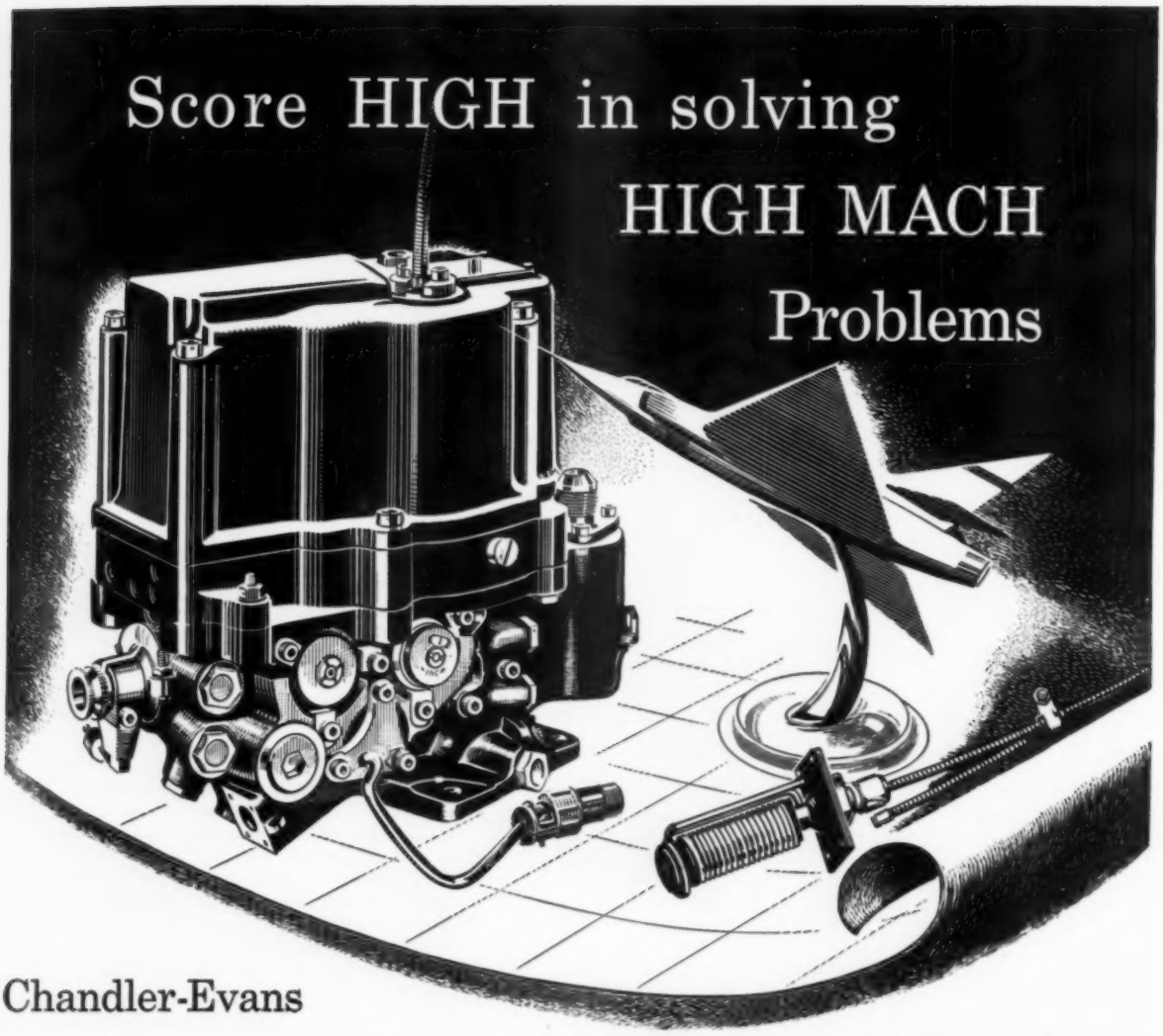

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WHO'S WHERE

(Continued from page 23)

Dr. Herbert Bandes, chief engineer-semiconductors, Electronics Division, Sylvania Electric Products, Inc., Woburn, Mass.

Joseph W. Semkow, manager (Dayton office), Dalmo Victor Co., San Carlos, Calif.

William O. Hoverman, manager-sales, General Electric Semiconductor Products Dept., Syracuse, N. Y.

L. W. Slater, director-purchasing and material control, Southwest Airways Co.

Harry R. Wege, manager, Missile and Surface Radar Dept., Radio Corporation of America, Moorestown, N. J.

C. G. (Chet) Miller, manager-advertising and public relations, Patushin Aviation Corp., Patushin Industries, Inc., Los Angeles, Calif., and Hawaiian Airmotive, Ltd., Honolulu.

Dr. Harner Selvidge, staff engineer, Western Divisions of Bendix Aviation Corp., Detroit, Mich.

Fred S. Hage, Jr., director-public relations, Solar Aircraft Co., San Diego, Calif.

Edward T. Keast, Jr., "Sea Bat" project engineer, Piasecki Aircraft Corp., Philadelphia, Pa.

Raymond B. Whitney, assistant director-sales, Logistics Research, Inc., Redondo Beach, Calif.

William H. Kafferlin, in charge of newly established aircraft Engine Components Section, Aero Supply Mfg. Co., Inc., Corry, Pa.

Garrett B. LeVan, manager-rod and bar operations, Mallory-Sharon Titanium Corp., Niles, Ohio.

John Torian and **Dr. Jacob Zar,** staff engineers, Guided Missiles Division, Republic Aviation Corp., Hicksville, N. Y. Also: **Philip Rountree,** section head-propulsion.

Frank L. Moncher, chief engineer-airborne products, Vickers, Inc., Detroit, Mich.

I. G. Davis, Jr., planning director, Rheem Manufacturing Co., at the firm's South Gate, Calif., facilities.

Herbert A. Fox, director, Future Planning Division, L. O F. Glass Fibers Co., Parkersburg, W. Va.

Capt. Peter C. Fair, general manager, Bahamas Airways, Ltd., associate of British Overseas Airways Corp. **Ben Wiggett** continues with the Bahamas carrier as deputy chairman and director.

A. J. Valley, chief engineer, and **Walter H. Righter,** chief engineer, Missile Products Corp., Glendale, Calif.

Clement J. Savant, Jr., chief engineer, Western Division, Servomechanisms, Inc., Hawthorne, Calif.

George H. L. Norman, sales manager, Pacific Division, Sprague Electric Co., Los Angeles, Calif. Also, **Frederick J. Nichols,** manager, filter operations and **Gilbert B. Devey,** coordinator of computer activities.

Bernard Bernstein, engineering staff, Gulton Manufacturing Corp., Metuchen, N. J.

William L. Healy, Jr., general manager, Sight Light Division, American Machine & Foundry Co., Deep River, Conn.

James Robertson and **Mayo Brandjord,** Customer Service Division, Northwest Orient Airlines.

Howard Ostran, factory superintendent, semiconductor products plant, Bendix Aviation Corp., Red Bank, N. J.

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Spark Test Voltage	3000 volts
Insulation Resistance	Greater than 10^4 megohm/1000 ft.
Continuous Operating Range	—90°C to +210°C†
Flammability	Does not support combustion
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Tensile Strength	2000-3000 PSI
Shrinkage	Less than 1/8" in 18" at 250°C
Abrasion (Per MIL-T-5438)	Passes 30" of 400 grit, aluminum oxide, ½ lb. weight
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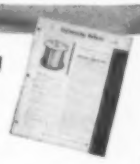
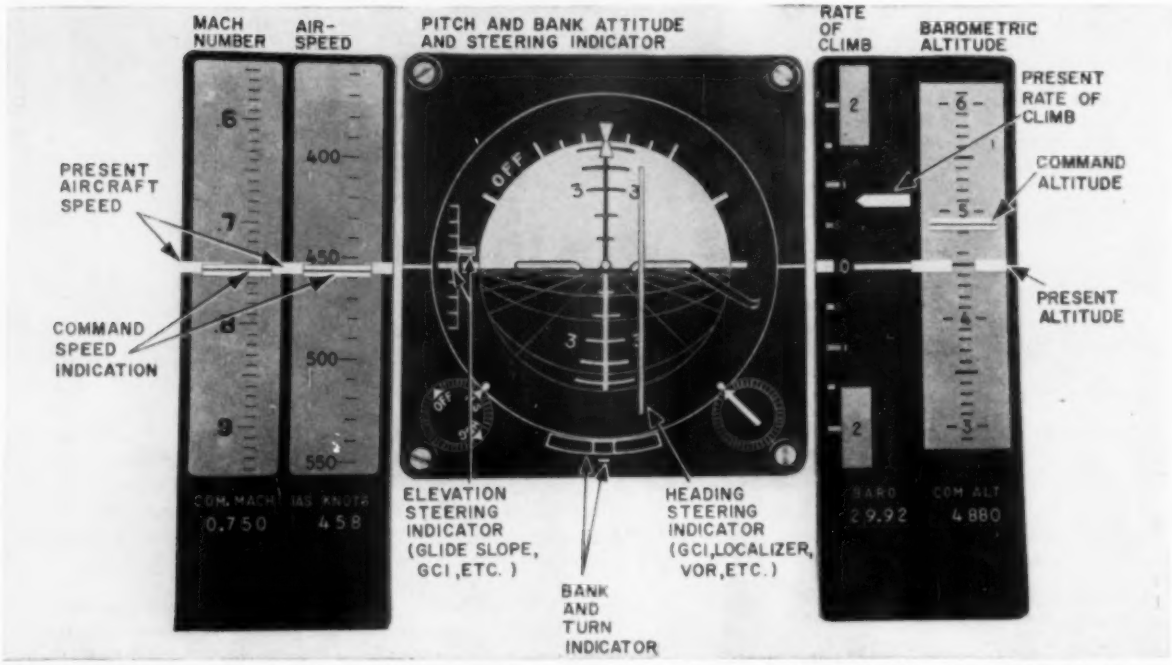
†Wire passes 96 hour, 250°C heat ageing test as required by MIL-W-16878.

Write today for Engineering Bulletin No. 1901 describing Revere PERMACODE wires.



Revere CORPORATION OF AMERICA 17

WALLINGFORD, CONNECTICUT A Subsidiary of Neptune Meter Company



USAF'S NOVEL integrated cockpit display, showing mock-up of pitch-bank axis portion ("Forward Look"). Several different instrument designs are being investigated.

Instrument Design, Part I:

USAF Reveals New Instrument Concept

By Philip J. Klass

Dayton, Ohio—A radical change in Air Force cockpit instrument panel design is expected to make its initial appearance in production aircraft before 1960.

The completely integrated "whole panel presentation," as it is called, will tell the pilot where he is, what his airplane is doing, and what he should do to carry out his mission in clear, natural and unequivocal instrument displays. This will replace the present ambiguous and redundant collection of individual panel instruments which tax the pilot's ability to gather and integrate vital flight information in the split seconds available in high-speed jets.

The new cockpit display will be tailored to the airplane's specific mission, be it interceptor, fighter bomber, bomber, transport, helicopter or reconnaissance.

Many of the basic elements which make up the integrated display will be common to all types of aircraft.

Integrated Effort

Equally important from the standpoint of early implementation, major segments of the new whole-panel presentation can be substituted for existing groups of panel instruments without waiting for completion of the entire integrated display. (In this respect, the Air Force approach differs markedly from another bold cockpit instrumentation program under development by the Navy which employs flat cathode ray tubes and a central station digital computer.)

The USAF's whole-panel presentation program is an integrated effort which involves several different Wright Air Development Center laboratories. The project is headed by the WADC Flight Control-Display Integrating Working Group, a staff function under the Flight Control Laboratory where much of the work is being done. Other WADC laboratories contributing to the program include: Communication and Navigation, Weapons Guidance, Aerial Reconnaissance, Aircraft, Aero-Medical, and the TRACALS (Traffic Control and Landing Systems) project office.

WADC already has awarded more than 100 contracts for the development of elements of the integrated display and state-of-the-art research in the field of human operator requirements, control integration and display techniques such as the possible use of cathode ray tubes.

Program Objectives

Here are some of the things which WADC expects to accomplish with its new integrated instrument display panel:

- **Better utilization** of airplane capability. WADC believes that pilots are not able to exploit full performance capability built into their aircraft under instrument conditions. The new display is expected to increase utilization of airplane performance.
- **Boost mission** effectiveness and safety. New display is designed to include the pilot in the basic airplane control loop.
- **Reduce training** requirements. New display will be designed to follow natural human instincts rather than forcing pilot to adapt to unnatural type of presentation.
- **Reduce cost,** weight and complexity

of cockpit instrumentation. New method will combine related functions into a single display, thereby eliminating redundant instrumentation.

Three Basic Types

WADC has broken down the dozens of cockpit instruments into three general categories for the purpose of its integrated display program:

- **"Forward Looking:"** These instruments indicate such things as pitch and roll attitude, rate-of-climb, altitude, airspeed, angle of attack, G-load, Mach number, glide slope displacement, and steering signals.
- **"Downward Looking:"** These instruments show such things as magnetic heading, bearing, or relative position to radio aids, target or destination.
- **Power Plant:** This includes such engine functions as rpm; thrust, temperature, oil pressure, optimum cruise settings, and fuel consumption.

Forward-Look

Heart of the forward-looking instrumentation is a combination pitch-roll attitude and flight director indicator, the latter capable of giving both pitch and turn steering commands throughout the mission, including take-off, climb, cruise, weapon delivery, return to base, approach and landing. In addition, this instrument will contain the familiar turn-and-bank (needle and ball) indicator, but the needle will be tilted 90 degrees so that the pilot will see only its tip.

WADC is investigating a variety of configurations for this all-important vertical display. One shows a resemblance to the Sperry Integrated Instrument System indicator. (See photos, p. 64). A significant difference is in the possible use of perspective lines on the spherical horizon indicator to give it a pseudo three-dimension look.

Another approach which WADC is investigating is the use of a moving tape instead of the usual sphere to show attitude information. The tape will move vertically through the equivalent of 360 degrees of airplane pitch movement and will rotate to display bank angle through a full 360 degrees.

Pitch and bank steering commands, from fire control, bombing, navigation, or instrument approach and landing systems, may be displayed on small vertical and horizontal pointers. Another possibility is to use a miniature "phantom" airplane which the pilot tracks much as he would if he were flying on the tail of another airplane.

Altitude, Rate-of-Climb

Two experimental vertical situation display indicators, under development by Lear and Sperry, are slated for delivery and evaluation later this year.

One of the most novel changes in instrument configuration will come in the altitude and rate-of-climb indicators. Although several different configurations are under consideration, they all employ a rectangular construction instead of the familiar circular shape.

In one configuration (see photo, p. 62), altitude is displayed on a moving tape which permits using a vastly expanded scale with greater readibility and accuracy. Also included is a "Command Altitude" marker which can be set manually by the pilot to indicate his assigned altitude, or it can be positioned remotely from an airborne fire control computer or from the ground via "radio data link."

The rate-of-climb indicator, mounted alongside the altimeter, displays its information by means of a moving pointer and fixed scale for rates up to 2,000 ft./min. For higher rates, when the pointer reaches the end of its travel, a moving tape in small windows at the top or bottom of the scale shows airplane rate-of-climb.

This gives the pilot both a fine and coarse scale indication.

The new altimeter and rate-of-climb indicator, as well as many of the other instruments, will be servo-driven, operating from a remote master air data computer or sensing elements. The servo driven primary flight instruments will contain an integral mechanical sensor for standby operation in the event of an electrical malfunction.

A somewhat more sophisticated design under investigation also provides terrain clearance, cabin pressure, altitude steering signals and a standby barometric altimeter in the event of power failure. (See photo, p. 64).

In this version a third "planning" scale is included to give the pilot an expanded view of the complete altitude range, showing:

- **Present airplane altitude** (white arrow).
- **Assigned or command altitude** (double horizontal bars).
- **Altitude steering indicator** (white dot) which helps pilot to reach assigned

Aircraft Outstrip Instruments

For the 25 year period between 1921 and 1945, military aircraft speeds increased an average of only 15 mph. per year. But in the past 10 years speeds have jumped an average of 165 mph. per year. This tremendous increase has resulted in aircraft which are far less forgiving of human error, yet give the pilot much less time for planning and decision making.

The pilot can no longer fly by the "seat of his pants," even in VFR weather. He is completely dependent upon his instruments for information on where he is, what attitude his plane is in, and what human control actions are needed.

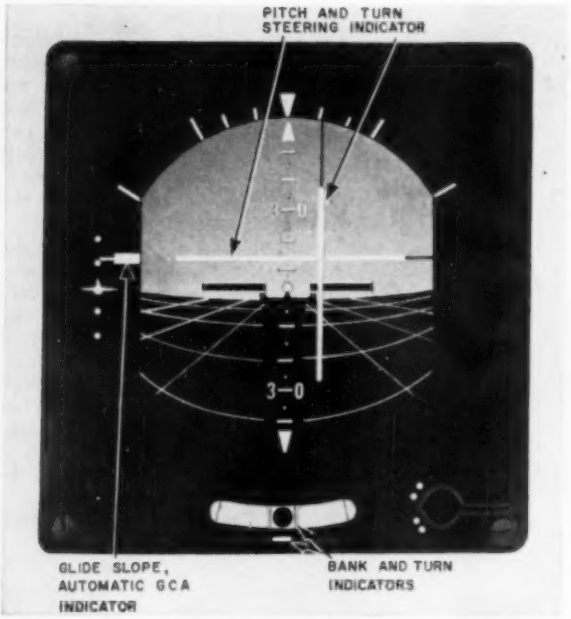
Despite this critical dependence of the pilot on his instruments, they have undergone little basic change except for scale factor required to accommodate higher aircraft speeds and altitudes. In the few instances where significant changes have been made, they have taken place in individual instruments, usually without relation to others on the panel.

Previously cockpit instruments for displaying navigation, fire control, bombing, engine and flight functions were developed by separate WADC laboratories, without the coordination that exists today in the new Working Group. The result was a "Topsy-like" growth in the number of instruments, a mad scramble for preferred location, and frequent redundancy of information in separate instruments.

With existing instrument panels, the pilot must scan a number of instruments, extract the information he needs at the moment, mentally integrate it with data from other instruments, then make a decision on what control action he should take. This process is made more difficult by "reverse sense" indications of instruments displaying the same information, or ambiguous instrument displays.

"In some instances we have inadvertently laid a trap for the pilots to misinterpret an instrument," says Capt. Lawrence C. Wright, past chairman of WADC's Flight Control-Display Integrating Group. "Isolated bits of information have not been presented in a manner which will convey the full intelligence or the proper relationship between displays and the required control action."

Increased airplane performance, coupled with new tactics, have created the need for sensing and displaying increased amounts of information. This, together with the tendency to reduce the number of crew members, thereby adding to the number of pilot functions, has brought us to the point where there is not sufficient space available to display each function individually or permit useless display redundancy, according to Wright. He cites as an example the instrument panel of a new fighter-bomber which already is loaded to the hilt, but must somehow accommodate three new indicators.



SEVERAL COMBINATION pitch-bank and steering indicators are under investigation. Unit at left employs vertical-horizontal needles to display steering commands. Unit at right has miniature phantom target which pilot tracks much like an enemy aircraft.

altitude without overshooting.

• **Cabin pressure** (white cross-hatched area).

The center precision altitude indicator has a colored moving scale (shown black cross-patched) which operates from radio/radar altimeter signals to show airplane altitude above the ground.

Separation between the cross-hatched scale and the heavy middle bars shows the pilot his clearance above the ground. The double white bars at the top of the center scale also show command altitude.

In the photo, these command bars are offscale at top, showing pilot he must climb. This marker will start to move back toward the center of the scale when the airplane comes within approximately 1,500 feet of the command altitude.

The narrow tape which appears between the center altitude indicator and the rate-of-climb scale is a precision altitude indicator for use during final approach and landing.

WADC has awarded contracts to Eclipse-Pioneer and Servomechanisms for the development of experimental altitude, rate-of-climb indicators.

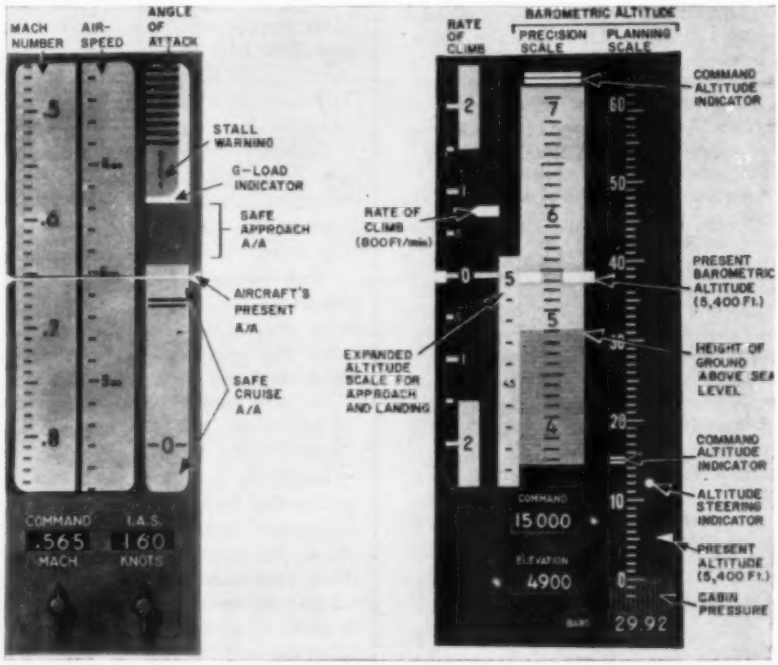
Airspeed, Mach Number

Similar rectangular display configurations are under investigation and development for airspeed and Mach number indicators.

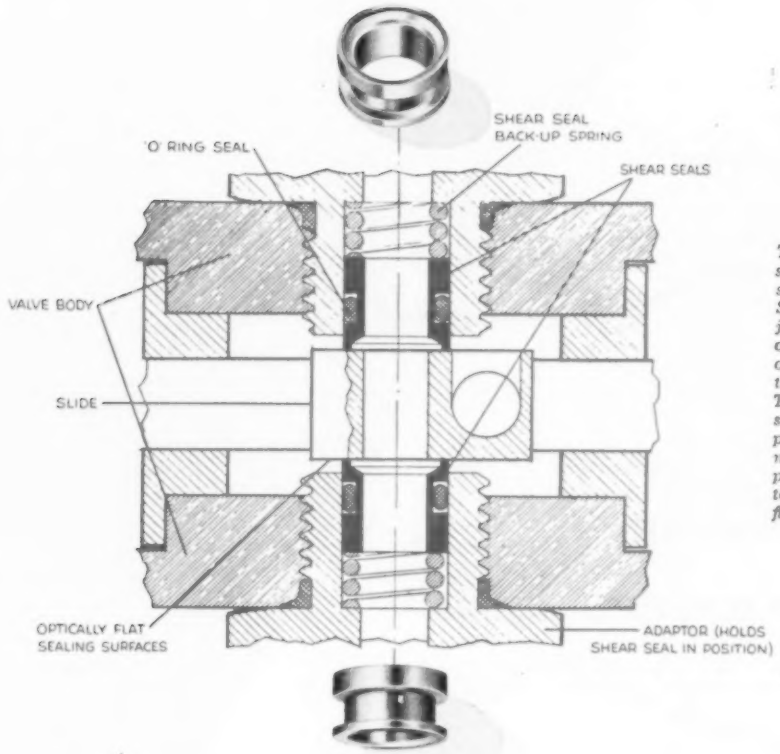
Both also employ moving tape type presentations to give good readibility and accuracy. (See photo at right).

Broken heavy white bars at midpoints of each instrument provide a lubber line for reading airspeed and Mach number. Command airspeed and Mach can be set in manually by the pilot, remotely set from armament or cruise control computers aboard the aircraft, or set in from the ground via data link. Heavy white center markers along the face of the instrument show command speed. When the aircraft is at its command airspeed and Mach number, the marker bars and lubberlines will coincide.

A more sophisticated version in-



VERTICAL INDICATORS represent another possible USAF approach to displaying Mach number, airspeed, angle of attack, G-load and rate of climb, barometric altitude, terrain clearance and cabin pressure. "Command Value" markers are included.



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*Protected by U.S. and foreign patents issued and pending.

cludes the addition of an angle of attack and G-load indicator. (See photo, p. 64).

A moving scale, suitably colored, shows whether aircraft is flying at a safe cruise angle of attack, or is in danger of stall.

Required angle of attack, which might be determined by a fire control computer is displayed with black parallel bars.

L-Shaped Indicator

A backward L-shaped indicator moves down toward the center lubber line to warn the pilot when he is pulling near-critical G-loads.

Because Mach number is of little significance at low approach and landing speeds, WADC is considering adding "wheels down," "flaps down," and "brake chute" symbols on the lower ranges of the Mach number scale. Thus when the pilot has reached a safe speed for lowering the gear, dropping flaps, or popping his brake chute, an appropriate symbol will appear on his Mach number indicator.

Kollsman and Eclipse-Pioneer instrument firms are developing experimental models of the airspeed and Mach number indicators under WADC contract.

Common Frame of Reference

The full operational significance of WADC's rectangular indicators is not readily apparent until they are seen as part of the complete vertical situation display, as shown on p. 62. This results in a common center line pitch reference which extends across the full instrument array, with a consistent relationship between all of the instruments.

For example, when the pilot pulls back on the stick, an indication of all vertical functions affected by his action will be displayed side-by-side. When the aircraft is at its assigned altitude, in level flight, all of the instrument pointers will be aligned to form a single white line extending across the bank of instruments.

Unbroken Line

ARDC considers the addition of "desired performance" (command) information on the same instrument as the "actual performance," utilizing the unbroken-line principle, to be a major step in simplifying the pilot's job. The pilot can fly the aircraft simply by keeping the line unbroken. He does not have to remember numbers.

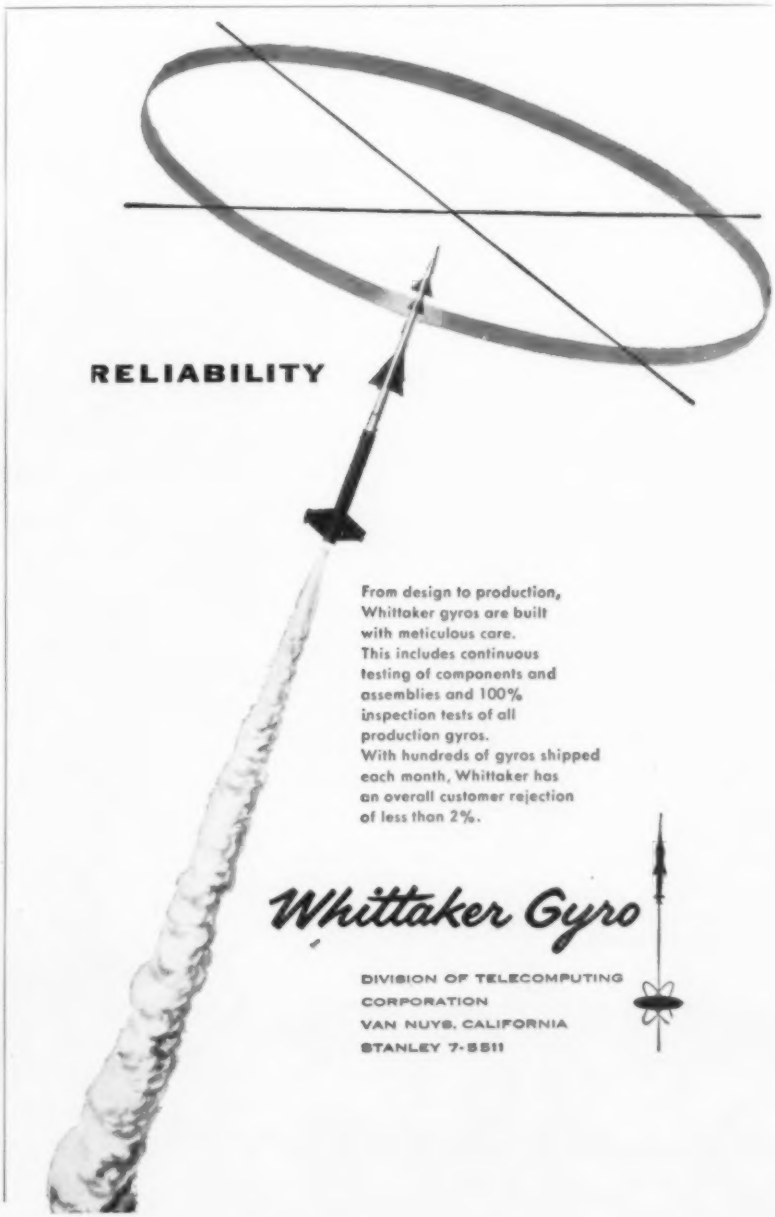
WADC's approach to the integrated display of plan position, (downward looking) and power plant information, and its relation to the vertical situation display, will be described in the concluding article to appear in a subsequent issue of Aviation Week.

FILTER CENTER

► **New Hot Transistor Material**—Silicon carbide appears to hold considerable promise for raising top operating temperature limit of transistors from present 200-300c to 500c or higher. However, knotty processing problems must first be solved, including growing of mono-crystaline structure.

► **New Flush Radar Antenna**—Trough waveguide, a new technique developed by Airborne Instruments Lab under Cambridge Research Center sponsorship, looks promising for flush-mounted scanning radar antennas. Device resembles conventional waveguide except that one side has been left off and a small center fin has been added. Varying the height of center fin by electromechanical means causes the emanating beam to scan. When used as a waveguide, new trough-design can be operated over a frequency range 50% greater than a conventional waveguide.

► **Better Transistors Coming**—Watch for a major improvement in quality and uniformity of silicon transistors within 12 months as a result of improved techniques for refining pure silicon and for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The Sciaky Predetermined Electronic Counter Weld Control employs a Dekatron tube to count the cycles of power line frequency and impulses of secondary current in predetermined absolute numbers and without deviation. Since power line frequency is maintained by reference to Naval Observatory time signals, you get these same standards of accuracy with the new Sciaky Control. Welder functions are *CENTRALIZED* — only one Dekatron tube is used to control succeeding functions such as "squeeze, weld, hold, and off".

The Sciaky Predetermined Electronic Counter Weld Control is absolutely consistent. Positive adjustment snap switch control dials are calibrated in cycles and impulses. You set the number of cycles and impulses you want and you get them throughout the longest or shortest run—and you can easily reproduce them at any time.

Unitized, plug-in sub-assembly units are used to simplify maintenance and make it possible to add welder functions easily. In either case, down time is limited to the few minutes it takes to plug in a spare assembly or the additional units desired.

To find out more about this revolutionary new control ask to see your Sciaky Sales Engineer or write for Bulletins No. 338 and No. 339. There's no obligation.

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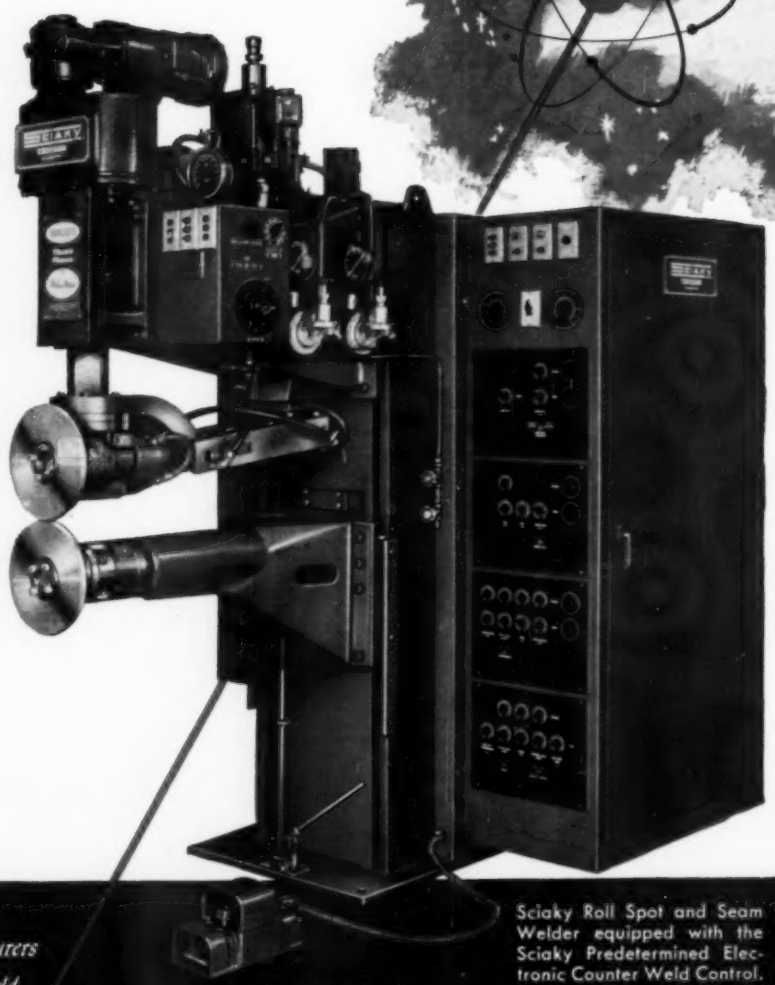

Sciaky Roll Spot and Seam Welder equipped with the Sciaky Predetermined Electronic Counter Weld Control.

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growing uniform crystals. Air Force Cambridge Research Center has developed new technique for removing contaminating impurities such as boron, from silicon tetra-iodide that previously could not be separated out. AFCRC expects to achieve a 50% increase in silicon resistivity with the new process.

► **Enroute Space Reservisor**—Teleregister Corp. is developing an adaptation of its airline reservations computer (Reservisor) for storing aircraft flight plans. Enroute airspace reservisor, slated for completion next year, can be instantly interrogated to see if a new proposed flight plan conflicts with any portion of those already on file. Display lights will show clear airspace or conflict for individual segments of the airway along the proposed route. Device is being developed under sponsorship of Cambridge Research Center's Navigation Lab.

► **AGCA "Battle"**—Gilfillan's new improved automatic GCA, being readied for evaluation tests at Rome Air Development Center, reportedly is the center of a minor battle within the Air Force.

AF's TRACALS (Traffic Control and Landing System) people feel that AGCA in present form lacks sufficient advantages over existing GCA and ILS to justify its adoption and the scrappage of ILS. They believe AGCA development should be continued to include fully automatic landing. However, Tactical Air Command reportedly believes AGCA would make a valuable addition to its operations and is contemplating its purchase.

► **RCA Arms F-104**—Radar fire control system used in the new F-104 was developed and is being produced by Radio Corporation of America, the company discloses.

► **High-speed Adder**—National Bureau of Standards has developed a new technique which makes it possible to add two 53-bit numbers in one microsecond. The new parallel adder was developed by A. Weinberger and J. L. Smith of NBS. Summary Technical Report 2011 gives further details.

► **New RTCA Members**—The Edo Corp., College Point, N. Y. avionics manufacturer, has been elected to membership in the Radio Technical Commission for Aeronautics. Also elected was Norden Laboratories, a division of Norden-Ketay Corp.

► **Contract of $800,000** was awarded Craig Systems, Inc., of Danvers, Mass., for mobile air traffic control system for temporary or newly-established USAF air fields.

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NORTH AMERICAN AVIATION, INC.
12214 Lakewood Boulevard, Downey, Calif.

Fiscal 1957 to Bring Air Taxis $20 Million

By Erwin J. Bulban

New York—Air taxi services are establishing themselves as an important adjunct to the scheduled airlines and as a top source of income for fixed base operators. A congressional subcommittee, studying operators pleas to abolish the 10% transportation tax on their services, estimates that the 1,600-odd air taxi firms in the U.S. and possessions will gross some $20 million in Fiscal 1957.

No one can pin down the overall air taxi picture with reliable and up-to-date statistics—they don't exist. The best data is obtained from the National Air Taxi Conference, an affiliate of the National Aviation Trades Assn. representing 116 member air taxi companies. Even NATC is reluctant about revealing figures: its members, now operating in the black after many lean years, are reluctant to talk about profits, NATC says.

Figure Analysis

Latest report the association has on members' air taxi business, covering the period October 1954 through September 1955, shows they flew 27,135 revenue trips covering 5,622,401 revenue-miles and transported 79,534 passengers. Analysis of the figures indicates they provided feeder line assistance to scheduled airlines by handling approximately 12,500 passengers requiring air taxi service to make an airline connection or to reach off-airline points after completing their flights. The operators say they brought more business to the airlines than they picked up from them.

Lacking definitive overall data on air taxi operations, some measure of how they are doing can be gained by narrowing the field down further and looking at an NATC member, Air Taxi Co., Red Bank, N. J.

Steady 30% Growth

Operating in the metropolitan New York area, Air Taxi, a division of Red Bank Airport, Inc., has experienced only one year—its first—in the red, since starting operation in 1951. Business has grown at the rate of about 30% a year and the service has become the largest of all of the company's fixed base operations. President Walter Laudenschlager is one of NATC's founders and also pioneered the zone system, providing flat rates based on 25-mi. circles around the home base.

Air Taxi operates seven Beech Bonanzas and two Piper Apache Twins; is considering adding a helicopter to work out of the 30th Street heliport under construction in New York City (AW July 9, p. 41).

Some 75% of the company's business is in the first two zones—50 mi.—with most traffic generated at La-Guardia, New York International, Newark and Teterboro Airports, where it works under an operating permit from the Port of New York Authority. The bulk of the traffic comprises airport shuttles—getting passengers from one field to another to make airline connections; giving the airlines assists when they are sold out and taking salesmen and businessmen to off-airline points.

Air Taxi's rates run $10 per zone for the Beech Bonanzas, with a minimum of $15 for a one-zone trip; $20 per zone with a minimum of $25 for one zone in the Piper Apache Twins.

National Air Taxi Conference has interline agreements with 25 scheduled airlines, whereby the air taxi operators handle reservations for the airlines and get their passengers to the field to board an airliner. In turn the airlines will sell their passengers through tickets enabling them to get off the airplane and directly into a waiting air taxi to complete his flight to nearest point of final destination.

Air Taxi's experience has been that the airlines don't use through ticketing very often, airlines reservations personnel generally sending notice to the air taxi company via teletype to conserve paperwork and to lessen need for refunds.

Visual Flying

The company's seven Bonanzas and two Apaches operate on strictly visual flight rules; the single-engine equipment from 7 a.m. through official sunset, the Twins after sunset. The Apaches are on call when needed; some customers demand twin-engine equipment

Air Taxi Co. Operations

(January—June. 1956)

Period	Revenue Trips				Revenue Miles				No. Passengers [1]			
	Total	Passenger	Cargo	Ambulance	Total	Passenger	Cargo	Ambulance	Total	Airlines To	Airlines From	Other
January 1956	140	137	3	0	12,011	19,186	431	0	216	95	81	75
February 1956	174	169	3	2	19,125	30,093	400	3,840	294	122	99	122
March 1956	184	182	1	1	20,325	30,415	175	2,310	274	120	116	82
April 1956	258	253	4	1	28,340	41,490	3,475	1,260	436	184	156	174
May 1956	377	375	2	0	42,289	71,835	620	0	638	275	216	248
June 1956	449	449	0	0	52,441	93,860	0	0	786	236	235	435
Oct. 1954-Sept. 1955	2,982	2,913	66	3	343,242	446,078	10,834	9,840	5,592	1,691	1,812	2,089
All U.S. NATC Operators: Oct. 1954 Sept. 1955 [2]	27,135	21,810	5,134	227	5,662,401	6,388,603	285,569	160,856	79,534	5,655	6,251	67,684

1. Actual number of airline passengers is obtained by subtracting "other" from "total" in last four columns.
2. Data from 79 air taxi operations reporting to National Air Taxi Conference, affiliate of National Aviation Trades Assn.

AIRLINE trip completed, passenger takes air taxi Bonanza to small airport near home.

even on short flights. Both Twins are being modified to equip them for instrument flight. Currently, IFR conditions knock out about 20% of Air Taxi potential.

In the busy summer season, the company starts the day with an average of 20 reservations. There are heavy days, usually Fridays, when Air Taxi turns down as much as $1,000 worth of business because of prior reservations. Reservations are made by clients—Air Taxi has some 1,000 steady customers—airlines reservations personnel, hotels, travel agencies and Carey Transportation personnel who act as the company's agents at the airports.

MODIFICATION to Bonanza nose gear prevents wheel retraction unless oleo is properly extended. Arm (1) will not activate switch (2) if it isn't keeping retracting motor from energizing.

Pilot Training

Operating out of the heavy-traffic area of four large metropolitan airports provides considerable potential business, but it also imposes considerable responsibilities upon the pilots. Mixing small airplanes in with scheduled airline traffic at these terminals calls for skilled flying, knowledge of procedures and use of radio in the same precise way as airlines and tower people.

Air Taxi personnel know that their continued operation depends on staying in the good graces of traffic control. Thus pilot training is keyed to standardized procedures to minimize the effect of the operation on scheduled traffic.

Pilots are required to memorize scores of checkpoints en route between the major terminals: they have to know 32 landmarks en route to Newark, 54 for LaGuardia, 33 for New York International. Crystal positions on the Narco radios are standardized so that the pilot can switch quickly to the necessary frequencies just by counting the click stops.

On a flight from LaGuardia to Newark, for example, pilots have to make six frequency changes from rolling out of the gate at the former and arriving at the Newark gate; and often they will do this half-dozen times a day.

To expedite flow of airport traffic, Air Taxi pilots take off from the runway intersection, which generally keeps them in sight of the tower. Routes between the airports and home base are planned to avoid IFR holding patterns and their associate buffer zones.

Air Taxi planes are serviced by the parent company at Red Bank Airport, which handles complete engine and airframe work, except for Magnafluxing. The company has its own radio shop, but is awaiting a technician to handle this job.

A progressive maintenance system is used to avoid tying up the airplanes for any long period. Engine checks are made every 25 hours. If one plug doesn't check out, all of the plugs on that magneto are pulled and replaced. The Bonanzas operate about 800 hours a year, much of it in hot weather, making frequent takeoffs and landings. Aircraft and engines seem to stand up well under the pounding they take. At one stretch the Bonanza Continentals accumulated 14,500 hrs. with only one major malfunction.

Nosewheel Modification

An example of Air Taxi's ingenuity in "keeping 'em flying" occurred several years ago. The company had to develop a modification of a Bonanza nosewheel landing gear to prevent the recurrence of a wheels-up incident. The nosewheel oleo strut on one of its Bonanzas had gotten a little "soft," and when the pilot hit a bump during taxiing, the air in the oleo bled off and the strut went flat.

When the pilot retracted the gear after takeoff he noticed that the warning flag didn't come all the way up, but he decided that this was a malfunction of the indicator. Actually, when the strut retracted in the collapsed position, the right rear hinge on the nosewheel door was stuck, breaking the nose gear retraction arm from the bottom of the gear box retracting mechanism and jamming the landing gear in the nosewheel well.

Air Taxi installed a strut from the nosewheel scissors to a switch on the nose strut (see photo, left). The switch is set so that if the nosewheel oleo extends less than six inches after the ground load is off, the strut connected to the switch will not activate the switch and the electric motor retracting the landing gear will not be energized.

Copter Aids Research Inside Active Volcano

A Bell 47G helicopter is being used by New Zealand scientists to study phenomena inside an active volcano. The rotary wing craft repeatedly leapfrogged the 7,515-ft. summit of Mt. Ngauruhoe to bring concrete-encased geophones, miles of cable and a dozen personnel to an unstable landing site in the crater.

Cables were connected to an observatory six miles away where data on tremors inside the volcano are recorded.

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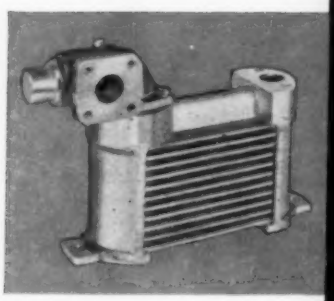

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TEMPERATURES MADE TO ORDER

HARRISON

EXPORTS OF AIRCRAFT, PARTS, AND ACCESSORIES FROM THE UNITED STATES: QUANTITY AND VALUE FEBRUARY AND MARCH 1956

(Money figures in thousands of dollars)

Item	March 1956		February 1956		Cumulative totals January-March			
					1956		1955	
	Number	Value	Number	Value	Number	Value	Number	Value
Aircraft, parts, and accessories, total	.....	73,122	.....	75,038	.....	194,021	.....	138,654
Commercial and civilian aircraft, total	108	16,299	117	13,405	352	38,193	360	42,131
Aircraft 3,000 pounds and over empty airframe weight								
Cargo transports, commercial, new	.....	.....	.....	.....	.....	.....	.....	.....
Passenger transports, commercial, new								
3,000-14,999 pounds empty airframe weight	4	275	3	345	8	696	7	403
15,000-29,000 pounds empty airframe weight	.....	.....	.....	.....	.....	.....	2	1,395
30,000 pounds and over empty airframe weight	8	13,546	6	9,912	18	29,993	19	26,576
Rotary wing aircraft, commercial, new	.....	.....	1	155	1	155	8	1,061
Commercial and civilian aircraft, used and rebuilt, including converted	4	1,553	14	2,054	25	4,136	43	10,173
Aircraft under 3,000 pounds empty airframe weight								
Utility, commercial and civilian, new								
3 places and under	27	176	21	135	86	531	86	591
4 places and over	37	385	54	644	135	1,627	100	1,221
Rotary wing, commercial, new	5	206	3	120	14	568	10	329
Commercial and civilian aircraft, used and rebuilt, including converted	23	158	15	40	.....	485	85	382
Commercial and civilian aircraft, new n.e.c. (all empty airframe weights)	.....	.....	.....	.....	1	2	.....	.....
Aircraft engines, reciprocating, new air-cooled under 400 hp[1]	112	253	85	227	280	631	341	744
Aircraft, components, parts, and accessories n.e.c.[2]	.....	56,570	.....	61,406	.....	155,197	.....	95,779

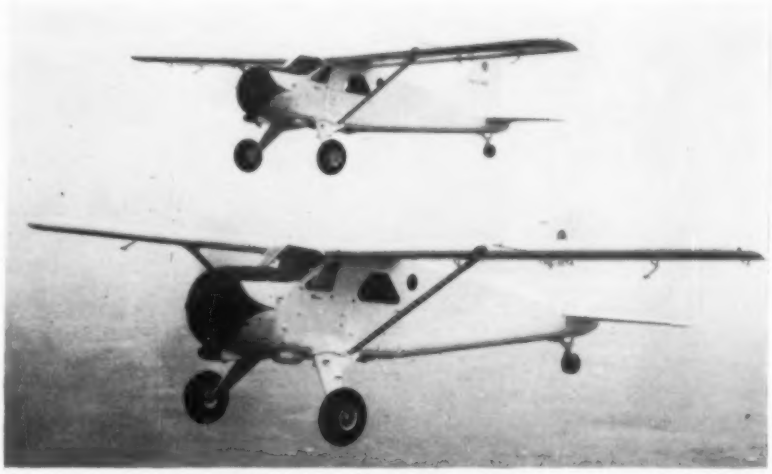
[1] Air-cooled reciprocating engines, new, 400 hp and over are included in "Other aircraft, parts, accessories."
[2] Includes military aircraft.

Source: Foreign Trade Division, Bureau of the Census.

CAA Spends $100,000 On Pilot Medical Study

A study to find out whether current civil pilot medical standards and examination procedures are still adequate for current operations will be undertaken by Flight Safety Foundation, Inc., New York. The project, to be completed by October 1, 1957, will be handled under a $100,000 contract awarded FSF by Civil Aeronautics Administration.

The study also will consider whether aircrew members, other than pilots, should undergo periodic medical checkups and if air traffic and mechanic personnel should be included. The study will seek to find out whether fitness standards and frequency of examination are adequate for transport, commercial and private pilots, or whether new standards might be evaluated to make it possible for pilots grounded due to physical infirmities to retain or recover flying licenses.

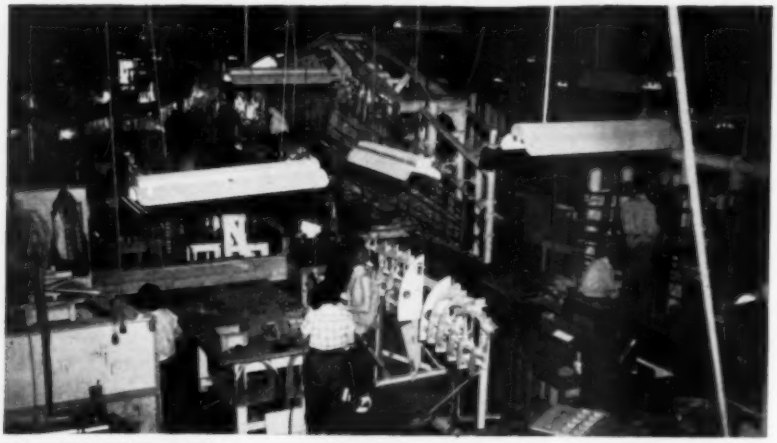


Venezuelan Beavers

De Havilland Aircraft of Canada Ltd. delivered two of its Beaver aircraft to Rutas Aereas Nationales of South America (RANSA). Delivery marked first such to Venezuelan company. Beaver operations in Venezuela will be similar to those in Canadian north country, i.e., transportation of personnel, equipment, material and supplies.

FINISHING TOUCHES go into Aero Commanders outside production hangar at Tulakes Airport, Bethany, Okla. Horton & Horton, Ft. Worth, Tex., does cabin interiors.

Commander Output in High Gear



ALL AVAILABLE SPACE appears to be fully occupied in this section building wings on heavy jigs. Aero Design plans to build a large production facility in the future.

FINAL ASSEMBLY shows six Aero Commanders angled on the line to fit the crowded area. An average of 10 twin-engine business transports are being delivered each month.

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Temco's new jet wins Navy Wings

The U. S. Navy has selected Temco Aircraft's sleek Model 51 as its first jet primary trainer. Filling its role in a new concept for primary training, the two-place aircraft will give Navy pilots of the future flight training that actually begins in a jet.

Designed, built and flight-tested by Temco at its own expense, the Model 51 now becomes the Navy's TT-1, after its selection in competitive flight evaluation tests at the Navy's Patuxent River Air Test Center.

The TT-1, basically designed to shorten the number of flying hours for military flight training, combines the flight characteristics of true jet performance with the safety features that student pilots need.

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Openings in all phases of aircraft design and development; write to Engineering Personnel, Temco Aircraft Corp., Dallas, Texas

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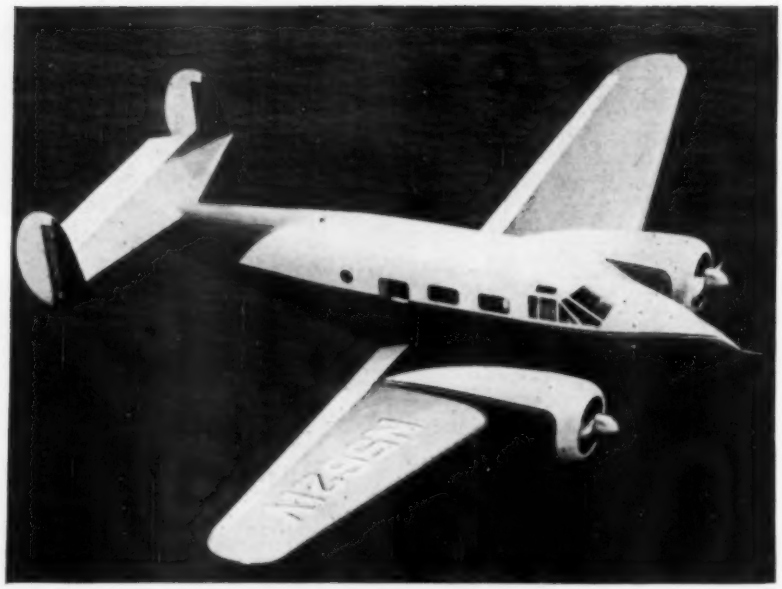


Twin-Beech Cruises at 245 mph.

Cruise speed of 245-250 mph. at full gross weight is claimed for this extensively cleaned-up Beech 18 business transport by owner J. L. Humpert, Hawaii. Particularly noticeable are the redesigned, pointed nose and revised engine cowls. Standard 450-hp. Pratt & Whitney Wasps are retained. A climb of 2,200 fpm. is also reported by Humpert, who plans to negotiate selling his modification ideas to a modification firm on a royalty basis.

Cruise Speed of 250 Claimed for DC-3

A modified Douglas DC-3 that cruises at 250 mph. on 750 bhp. has been test-flown by Aircraft Conversion Corp., Detroit-Wayne Major Airport, Mich. Designated the Challenger 250, the transport also shows measurable stability improvements over the standard DC-3, ACC executive vice president James Hurst reports.

During Civil Aeronautics Administration flight tests, the Challenger 250 also achieved 167 mph. TIAS with the left engine feathered. Plane's gross weight at the time was 26,200 lb., altitude was 4,500 ft. and the right engine was delivering 1,050 hp. A speed run at 100-ft altitude showed a 222-mph. TIAS using 775 bhp.

Bera and Bower Win 'Powder Puff' Derby

First place in the 10th annual all-woman transcontinental air race (Powder Puff Derby) was won by Mrs. Frances S. Bera, Los Angeles and co-pilot Mrs. Edna Bower, Long Beach, flying a Cessna 180. The 2,366-mi. race, conducted under visual flight rules, daylight flying only, started at San Mateo County Airport, Calif., and ended at Bishop Airport, Flint, Mich. It was the second straight time Mrs. Bera won the Derby and her third win of six tries.

Second place was taken by Mrs. Alice Roberts, Phoenix, Ariz., and Mrs. Iris Critchell, Palos Verdes, Calif., flying a Beech Bonanza; third place went to Mrs. Marian Craver and Mrs. Betty Lambert, both of San Diego, Calif., piloting a Piper Tri-Pacer.

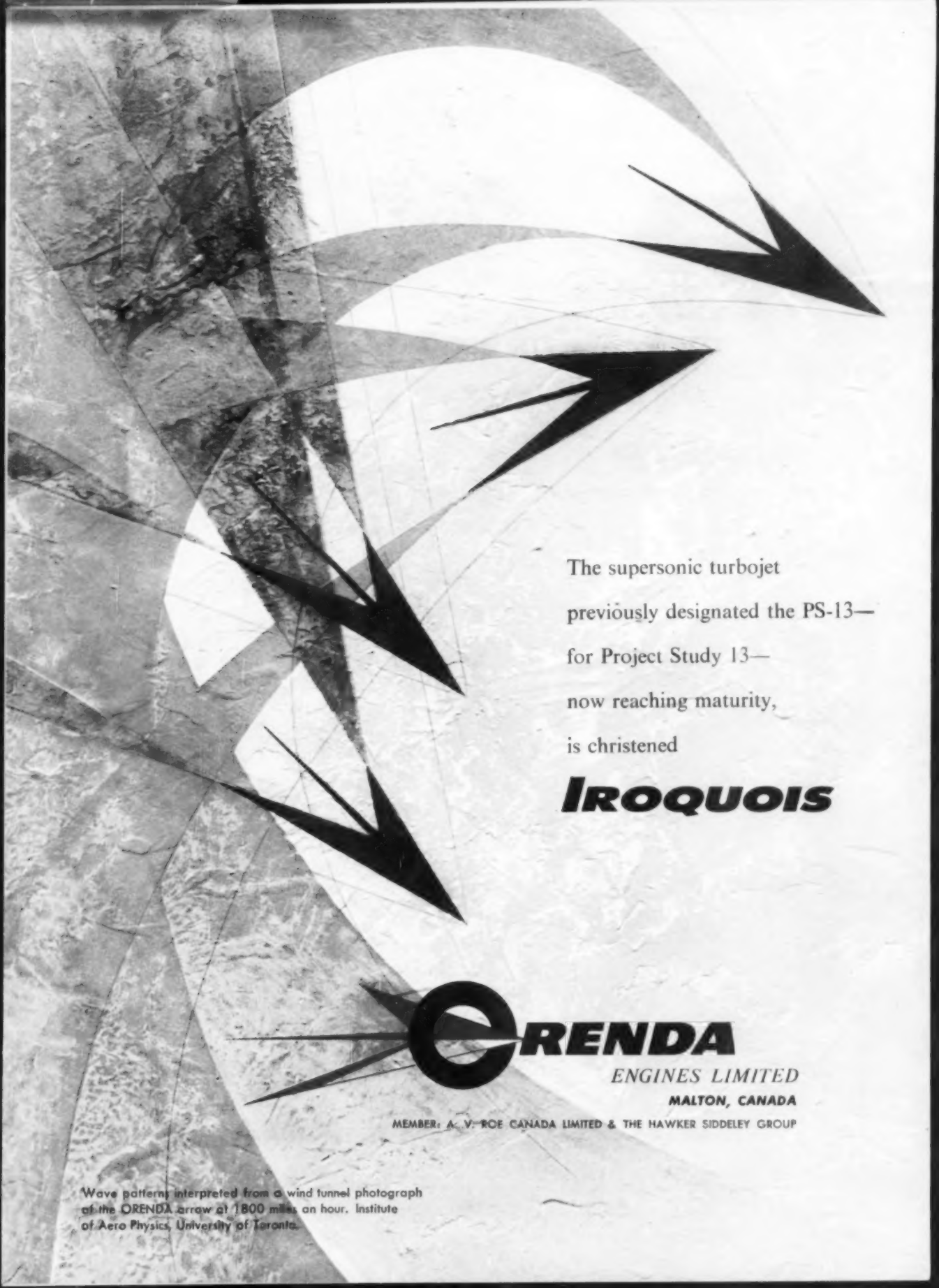
In another long-distance contest, the 2,309-mi. fourth annual transcontinental air cruise from Phoenix, Ariz. to North Philadelphia Airport, Pa.,

Cessna Sales Record

Cessna Aircraft Co. business plane sales in the first six months of 1956 topped deliveries in the whole of 1955 by 28 airplanes and exceeded the combined shipments of its three biggest competitors. It topped its nearest competitor, Piper Aircraft Corp., by 500 units.

In the first half of this year Cessna delivered 1,774 units having a factory net billing value of $21,585,809 and a retail value of $27,272,200. Details of the record-breaking sales gain were revealed during the company's annual two-day distributors' management conference in Wichita, Kan.

Increased deliveries were primarily due to customer acceptance of the tricycle landing gear Models 172 and 182, marketing manager Frank Martin pointed out. In the first half of this year 27% of its aircraft sales were to people who had never before owned an airplane.



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for Project Study 13—
now reaching maturity,
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Wave patterns interpreted from a wind tunnel photograph of the ORENDA arrow at 1800 miles an hour. Institute of Aero Physics, University of Toronto.

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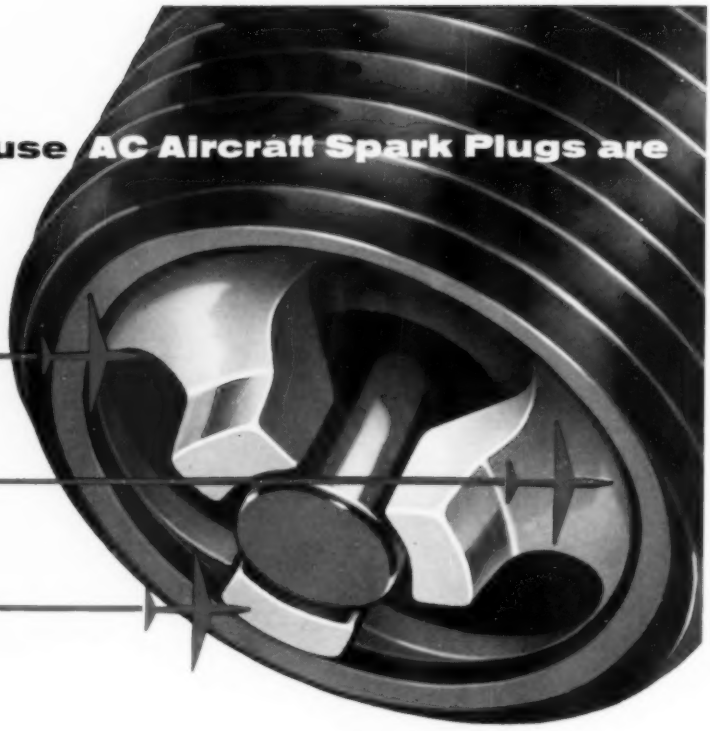

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first place was taken by a Navion piloted by Mrs. Fay Douhitt, El Centro, Calif. Mr. Douhitt was co-pilot. Second place winners were Richard M. Jackson and his father, Marvin Jackson, LaMesa, Calif., also flying a Navion. A Cessna 180 piloted by Mrs. Eugenia Heise and Dr. Herman Heise, Milwaukee, Wis., took third place.

Narco Doubles Radio Plant For Business Plane Orders

National Aeronautical Corp., more than doubled its previous capacity for radio and navigation equipment with the opening July 17th of a new plant at Ft. Washington, Pa. Plant is two miles from its previous Wings Field, Ambler, Pa., plant.

Major customers for its equipment are business aircraft owners. Narco makes no military products.

Plant design is such that it can be progressively expanded on the six-acre site to permit an annual output of $15 million worth of equipment annually. It estimates that this year deliveries will total $3 million in net sales, compared to about $1.6 million last year. Current backlog is approximately $750,000. Work schedule, previously six days a week, will now be five days at the new plant.

PRIVATE LINES

DIRECTOR TURNS ACTOR: Movie director Henry King (on wing of his Piper Apache) is set for a scene in "Sky Sentinels," a Civil Air Patrol documentary to be released in December. William P. Lear (left) sponsor of the film, checks the action.

Two DC-3s will handle a 3,750,000-acre airborne magnetometer survey in Bolivia for Bolivian Gulf Oil Co. Aero Service Corp., Philadelphia, Pa., the survey contractor, expects to do the job in three months. One DC-3 will carry the airborne magnetometer equipment, the other plane will supply needed airlift of personnel and material. Nearly five tons of Shoran gear will be used to guide the survey DC-3 over the unmapped terrain.

New attachment of sealing strips to aircraft engine deflectors has been designed by a Lycoming engineer for R1820 and R1300 powerplants to decrease cost and reduce field repair time. Rubber buttons on the seal flange permit attaching the seal directly to the deflector by inserting the buttons through drilled holes, eliminating metal strips and rivets.

Kern County Land Corp., San Francisco, purchased a 14-passenger DC-3, modified by Remmert-Werner, Inc., St. Louis, Mo. Electronic gear includes Collins 1716 360-channel VHF transmitter, three Bendix MN85 280-channel VHF omni receivers with dual radio magnetic indicators, dual Bendix ADFs, Sperry H6B electric gyro horizon, Dare 22-channel standby transceiver, Collins 51V2 glide slope and 51Z marker.

Atlantic Aviation Service is using a Piper Tri-Pacer to report weekend surface traffic conditions between Wilmington, Dela., and Trenton, N. J., to a local radio station for broadcast to motorists. Service will run through Sept. 9.

Cole Electric Co.

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Furthermore, today Rohr is *producing over 30,000 other parts* for aircraft of all kinds.

For the aircraft parts you need, take advantage of the tremendous engineering and production know-how that has made Rohr world famous for ready-to-install Pow-R-Pax for today's modern aircraft.

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Material Promises Powerful Magnets

Baltimore, Md.—Manganese-bismuth, a new magnetic material which promises to yield more powerful permanent magnets, is under study for future use by USAF's Air Research and Development Command. It was perfected as the result of a new and improved method for the preparation of highly purified manganese-bismuth in powder form.

Westinghouse Electric carried out the major research work under the leadership of Dr. Clarence Zener, acting director of Westinghouse research. Dr. Zener said the superlative magnetic properties of pure manganese-bismuth have been predicted for several years, but until now the pure form has been unattainable.

Improvements in the original technique are now under way at the Westinghouse Materials Engineering Department.

SCIENTIST WEIGHS a sample of highly purified manganese-bismuth which promises to yield the most powerful permanent magnets ever made. Because it burns spontaneously it must be processed in an inert atmosphere of helium.

Coercive Force

Perhaps the greatest advantage of the new manganese-bismuth magnets is their unusual resistance to demagnetization.

The magnets are at least ten times better in this respect than most commercial magnets available today. This resistance to demagnetization is called "coercive force."

Manganese-bismuth magnets are not affected adversely by external magnetic fields because of this high coercive force.

Thus they appear especially promising for use in electric meters where stray fields are likely to be encountered. They can be molded into a variety of unusual shapes for special uses. Magnets shaped into thin wafers or disks probably will be used widely.

HIGHLY PURIFIED manganese-bismuth for making super permanent magnets bursts into flame when scattered in air.

United Chemically

The manganese-bismuth is prepared by grinding the mixture into fine powder in an inert atmosphere of helium.

The purpose of the helium atmosphere is to prevent the powdered materials from burning spontaneously, which they do on exposure to oxygen. The manganese and bismuth are united chemically by sealing them in a glass vessel pressurized with helium and raising the temperature to slightly less than 520F, the melting point of bismuth. The resulting product is virtually 100% pure manganese-bismuth.

In order to fabricate the magnet, the material is re-ground into a fine powder and molded to shape in a plastic matrix which is oriented in a strong magnetic field.

Silver-Zinc Batteries Developed For Missile and Aircraft Use

Silver-zinc batteries (AW May 10, 1954, p. 71), designed especially for use in missiles and aircraft, have been developed at the Raleigh Engineering Laboratories of American Machine & Foundry Co. (AW July 11, 1955, p. 73).

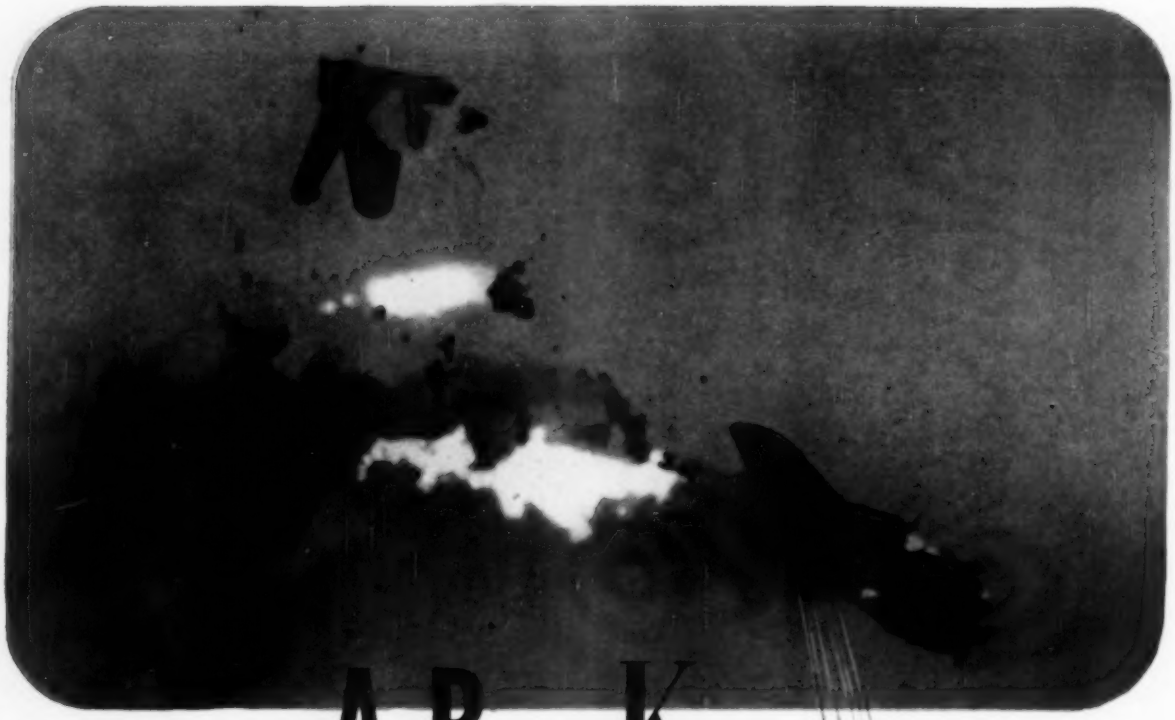
Initial production runs of some of the units are being made at the lab and also at AMF's new plant at Colorado Springs.

These four different types of silver-zinc batteries are being produced:

- **Self-activating, chemically heated** missile battery which has long shelf life (6-12 months) and which requires only two seconds to become activated at −65F.

The self-activating feature entails these advantages: time consuming filling and charging operations are eliminated and battery shelf life is greatly increased since electrolyte is not introduced into the cells until battery is to be used. Chemical heating, which takes place during activation, eliminates need of external heating source.

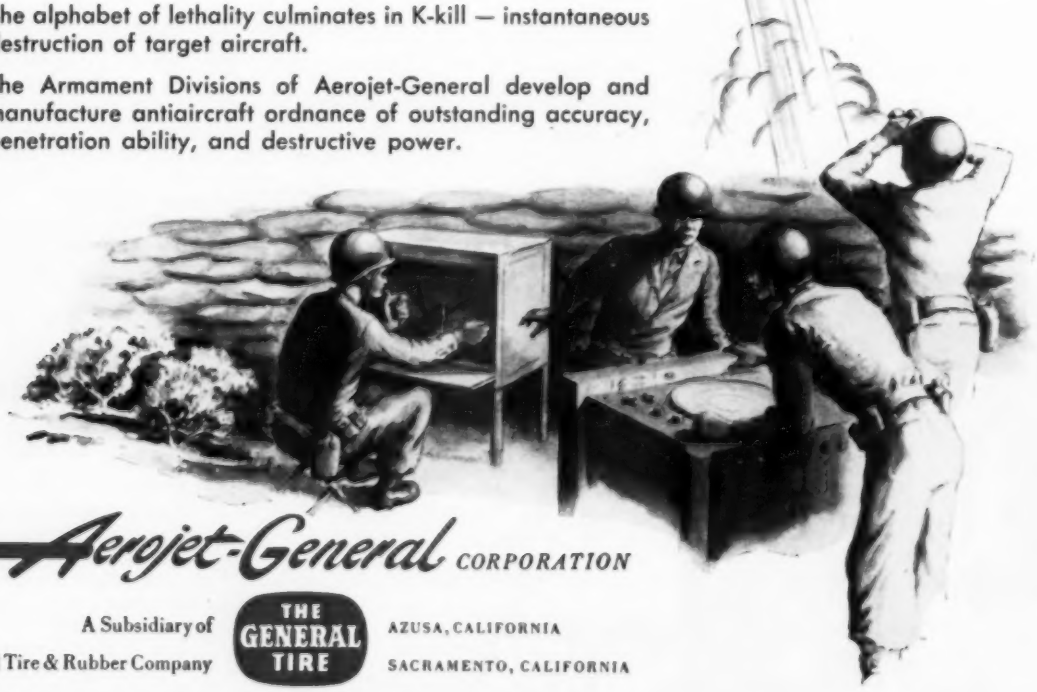
- **Self-activating, electrically** heated mis-



AS EASY AS A, B . . . K

The alphabet of lethality culminates in K-kill — instantaneous destruction of target aircraft.

The Armament Divisions of Aerojet-General develop and manufacture antiaircraft ordnance of outstanding accuracy, penetration ability, and destructive power.



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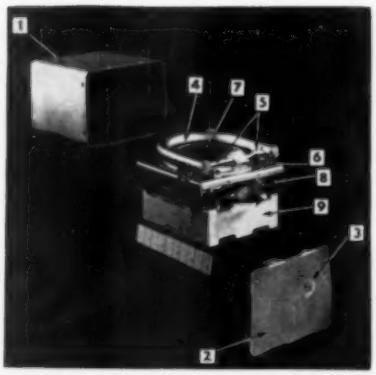

CHEMICALLY - HEATED, self - activating AMF battery delivers 28 and 7 v., weighs 6 lb. Components are: (1) Steel housing, (2) Top of housing, (3) Electrical connector, (4) Nitrogen pressure tube, (5) Dual gas feed lines, (6) Dual pressure relief valve, (7) Electrolyte reservoir, (8) Heat exchanger and electrical equipment, (9) Cell pack.

sile battery which is ready for use within one second of activation.

The unit is maintained at operating temperature by thermostatically controlled, electrical heating elements and insulation on the battery and electrolyte chamber.

It can be brought to operating temperature in less than 10 minutes when in a —35F ambient. Heaters require 300 watts.

To initiate activation of either battery, an impulse of approximately 1 amp., 6 v. for 2 milliseconds is applied. This releases compressed nitrogen from a chamber to force the electrolyte into the battery.

AMF's self-activating batteries are made up of these components incorporated in a hermetically sealed, steel

AMF 88-5 primary battery weighs 10.2 oz. and delivers 25 amps. at 9 v.

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MILITARY "B" TYPE HEAT-DISSIPATING ELECTRON TUBE SHIELDS* END TUBE FAILURES CAUSED BY HEAT AND VIBRATION!

IERC offers the only shields commercially available that will meet or exceed MIL-S-9372 for temperature resistance, vibration control, compatibility with all tube diameter tolerances and have approval as Heat-dissipation shields for providing lowest bulb operating temperatures through proper design and function.

Improve your equipment reliability—specify IERC "B" type shields to end premature tube failures caused by heat and vibration effects.

There is an IERC tube shield to fit your design and equipment needs. Write and ask for IERC technical bulletin 1204-356 on heat-dissipating shields and to receive new bulletins regularly.

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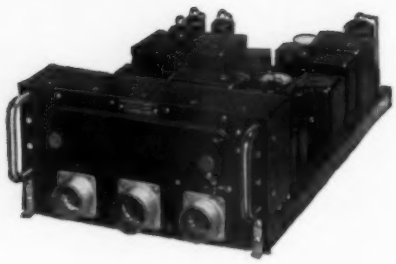
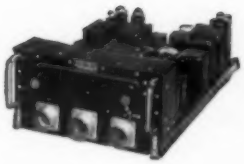
*Patents Pending—Cross-licensed with North American Aviation, Inc.



This is Honeywell's fire control coupler for jet interceptors. In conjunction with Honeywell's autopilots, it makes automatic interception a reality. Once radar has locked on the target, the fire control coupler slaves the autopilot to the radar, freeing the pilot for tactical decisions. This Honeywell coupler-autopilot team has already flown several classified interceptors.

AERONAUTICAL DIVISION, MINNEAPOLIS-HONEYWELL



Wanted:

Design and Development Engineers

THE fire control coupler you see on the opposite page is only *one of* many new control devices coming from Honeywell these days. Our many development programs are among the most advanced in the country. At Honeywell Aero prospects for even greater progress are very real.

With many design teams working on a great variety of projects, we have exceptionally exciting opportunities to offer engineers capable of designing components and systems for—

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At Honeywell you'll head up your own task group. Draftsmen, technicians, model makers and evaluation engineers essential to the project will look to you for technical instructions.

An engineering degree or its equivalent plus practical experience with related or similar equipment is desired.

Consider these advantages

- Minneapolis, the city of lakes and parks, offers you metropolitan living in a suburban atmosphere. No commuting.
- Travel and moving expenses paid.
- First-rate salaries, insurance-pension systems, plant and technical facilities.
- Honeywell, leader in control systems, is a sound diversified growth company, continually expanding, that offers permanent opportunity to you.

Write to us

If you are interested in a career at Honeywell, call or send your résumé to Bruce D. Wood, Technical Director, Aeronautical Division, 2604 Ridgway Road, Minneapolis 13.

MINNEAPOLIS **Honeywell**

Aeronautical Division

Long Screwdriver

A screwdriver with a 100-foot handle developed by Boeing enables a single mechanic to adjust distant fuel control screws while he monitors instruments in the cockpit. The device, called a "remote engine trim actuator," is a box containing two electrically driven screwdriver heads which fit into the screws when the box is attached to the underside of a jet engine. A long electric cord connects the screwdrivers with a remote control box. Formerly two mechanics were needed to make the fuel system adjustments. One in the cockpit watched the instruments and telephoned instructions to another who made adjustments with a hand screwdriver.

chamber: electrolyte chamber, one or more dry charged silver-zinc cells, compressed nitrogen chamber, chemical or electrical heating elements, transfer manifold, heat exchanger (if required) and electrical equipment to initiate activation.

These batteries are built to withstand the shock, vibration and acceleration of missiles. Being hermetically sealed, they do not release electrolyte or gas in operation.

Characteristics of a typical high rate, chemically heated unit are: 1.2 watt-hours/lb.; 0.635 watt-hours/cu. in.

• **High voltage primary pile battery,** developed for the Air Force, which efficiently delivers high voltage, low amperage power for airborne electronic equipment on a one-shot basis.

The battery is filled by a special, vacuum-operated device which eliminates electrolyte spillage.

The unit's voltage-time characteristic is flat and no high initial voltage is experienced as with rechargeable silver-zinc batteries.

Weight and volume efficiencies of 70 watt-hours/lb. and 5 watt-hours/cu. in. have been obtained.

The battery, which can remain activated for over a month, is being produced with cells of 0.1, 3 and 12 ampere-hours.

• **Secondary aircraft storage battery,** which delivers a high power output for jet engine starting, yet is much smaller and lighter than comparable lead-acid units.

Substitution of a silver-zinc battery for an AN3150 36 amp./hr. lead-acid unit saves 43 lb. and 500 cu./in. In the case of a K-1, 75 amp./hr. lead-acid battery, savings of 75 lb. and 900 cu./in. are possible.

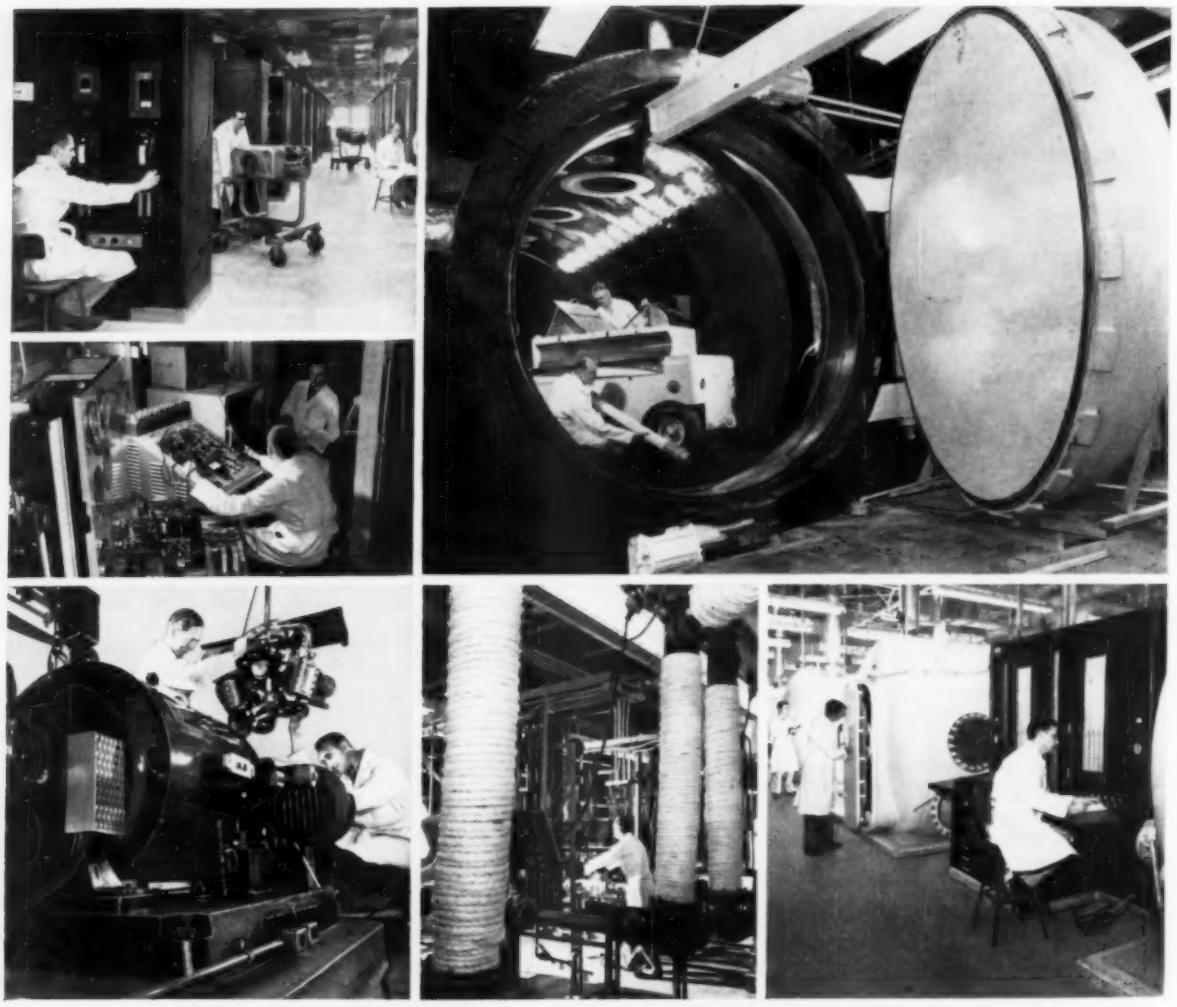
Pilot production is under way on four battery sizes ranging from 36 to 90 ampere-hour capacities.

OFF THE LINE

Convair's (San Diego) Salvage department handles over 2½-million pounds of scrap monthly. Sorting and salvage methods of all types of materials bring a return of $175,000 annually, either in reclaimed material or scrap sales. The company credits this saving to Hyster lift trucks, which haul most of the scrap.

A patent has been granted to Melchior Engineering, Inc. for the forming process of aneroid capsules used in the Melchior supersensitive altimeter now in prototype production by Bulova Watch Co. (AW Dec. 5, p. 29).

An order for an afterburner fuel control test bench has been received by Consolidated Diesel Electric Corp. from the Ford Aircraft division. The test bench will be used to check afterburner performance on the Pratt & Whitney J57 jet engines which Ford is building under subcontract.



New AiResearch Production Test Laboratory in Phoenix, Arizona

Finest production test facilities

prove aircraft system compatibility

Testing of critical aircraft components and systems is now performed on a precision production basis in these completely equipped laboratories.

Here, in more than 75 test cells and test stands, finely-engineered AiResearch products are given every test necessary to insure perfect operation.

Altitudes are simulated from 1,000 feet below to 75,000 feet above sea level; pressures up to 1,000 psi; temperatures from −80° F to +1,000° F; air flow up to 1410 pounds per minute.

Units tested include gas turbine engines, air turbines, air turbine starters, pneumatic controls, cabin pressure regulators, valves, refrigeration turbines, heat transfer equipment and complete systems employing these and additional components.

These unsurpassed test facilities are another reason why you can rely on the performance of AiResearch products.

Qualified engineers are needed now. Write for information.

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Designers and manufacturers of aircraft systems and components: REFRIGERATION SYSTEMS • PNEUMATIC VALVES AND CONTROLS • TEMPERATURE CONTROLS CABIN AIR COMPRESSORS • TURBINE MOTORS • GAS TURBINE ENGINES • CABIN PRESSURE CONTROLS • HEAT TRANSFER EQUIPMENT • ELECTRO-MECHANICAL EQUIPMENT • ELECTRONIC COMPUTERS AND CONTROLS

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Among them are:

air-conditioning
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electronic computers and controls
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The Garrett Corporation is also applying this engineering skill to the vitally important missile system fields, and has made important advances in prime engine development and in design of turbochargers and other industrial products.

Our engineers work on the very frontiers of present day scientific knowledge. We need your creative talents and offer you the opportunity to progress by making full use of your scientific ability. Positions are now open for aerodynamicists ... mechanical engineers ... mathematicians ... specialists in engineering mechanics ... electrical engineers ... electronics engineers. For further information regarding opportunities in the Los Angeles, Phoenix and New York areas, write today, including a resumé of your education and experience. Address Mr. G. D. Bradley

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Los Angeles 45, Calif.

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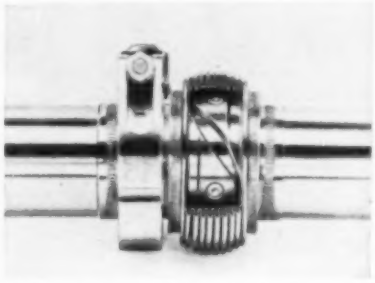
AiResearch Manufacturing, Phoenix
AiResearch Industrial
Rex – Aero Engineering
Airsupply – Air Cruisers
AiResearch Aviation Service

PRODUCTION BRIEFING

Temperature resistant paint has been developed by the Corps of Engineers' Research and Development Laboratories, Fort Belvoir, Va. Originally designed for diesel exhausts, the paint has withstood 1400F for 1200 hrs.

Universal joint for supersonic aircraft ducts has withstood both 800 psia and 600,000 flexure cycles at 200 psi and



800F. Designated MB11 it is made by Marmon Products Co., Inc., Los Angeles, Calif.

World's largest closed die forging—a 3,000 pound aluminum alloy X7079 backbone section for the Martin XP6M SeaMaster—has been removed from the

Air Force's 50,000 ton press at Alcoa's Cleveland, Ohio, works. Production of the die required several months engineering plus 1,500 man-hours for sinking and finishing each die half.

Titanium notes. . . . World's largest titanium ingot melting furnace will produce 10,000 lb. ingots for continuous-mill hot rolling of wide titanium sheets and large forgings, says Titanium Metals Corp. of America, Henderson, Nev. The company estimates that its sponge production for 1956 will reach 6,000 ton per year. . . . Rem-Cru is using present staff of 500 employees and 237,000 sq. ft. of space to double its

Want to save weight?

FINN lightweight mounting bases could save 7¾ lbs. on the **B-52**

FINN lightweight mounting bases could save 5½ lbs. on the **F-102**

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What about your project? Finn engineers will be glad to show you how you can eliminate extra weight yet pass all JAN and MIL specs. Write today for evaluation.

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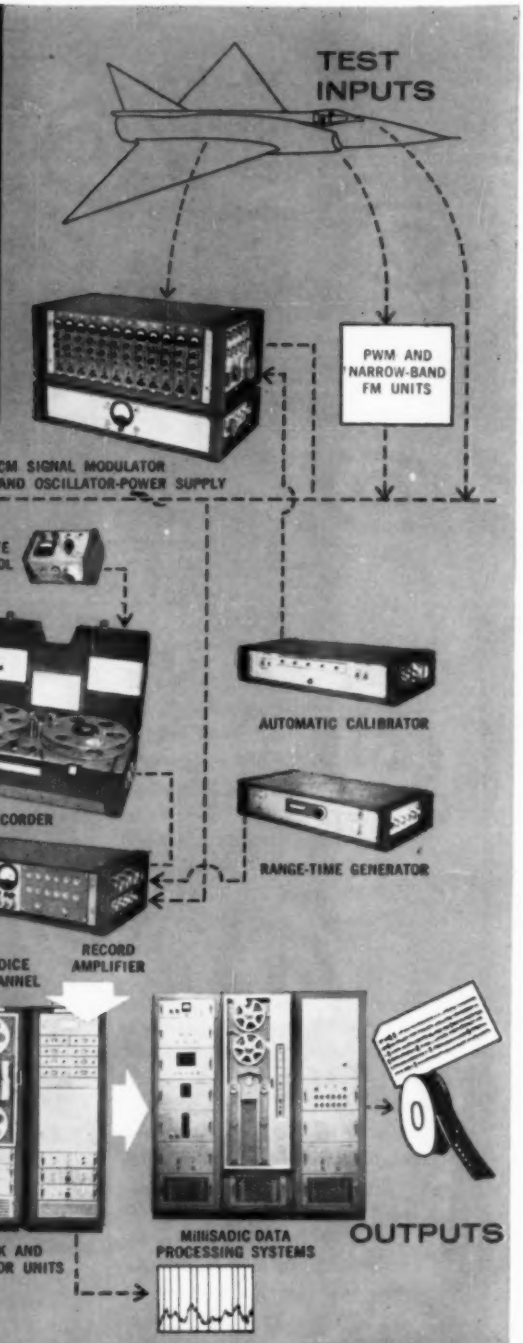
...the total answer to flight-test bottlenecks



Consolidated's long-standing leadership in flight-test instrumentation includes the pioneering of the "systems" approach—the designing of instrumentation for the *Total Answer* rather than just components. "Test Variables to Digits" is literally true as a description of CEC's products and experience.

From CEC's Transducer Division have come some of today's most widely used devices for *sensing* the parameters of supersonic flight. DataTape, shown at the right, was developed specifically for the problems of flight-test data *handling*, is a coordinated family of instruments ready to serve as a proven nucleus for a wide variety of data-processing systems. For the vital step of *digitizing* test data, CEC developed the SADIC and MilliSADIC group of instruments and systems—today's most comprehensive, *proven* line of analog-to-digital data-processing units.

The Consolidated Systems Division is ready to add to these basic units whatever output devices are needed to accomplish the test mission. These range from CEC's own MilliSADIC, ground playback and demodulator units, and recording oscillographs to the equipment of other manufacturers, such as oscilloscopes, spectrum analyzers, and chart recorders.

For the Total Answer to your data-processing problems... whether in connection with today's or tomorrow's aircraft and missiles... it will pay you to call in the experienced engineers of Consolidated Electrodynamics. There's no obligation. And for the story of DataTape, send today for Bulletin 1561-X15.

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CORPORATION

formerly Consolidated Engineering Corporation

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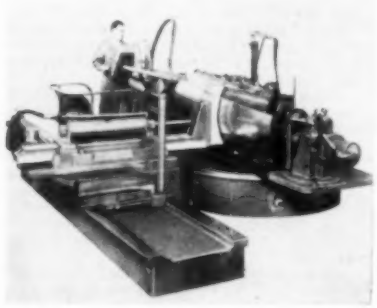
1955 titanium mill products output this year. . . . "In a little over two years the price of titanium sponge has dropped 40% from $5.00 a pound," says F. H. Weismuller, general manager, Du Pont pigments dept., as he recently announced a 25¢ a pound price cut. . . . Fred Spiegl, president of Titanium Fabricators, Burbank, Calif., predicted the steady price reductions in titanium will soon result in titanium replacing aluminum in aircraft. . . . Secon Metals Corp., White Plains, N. Y., claims to have drawn titanium wire as small as .001 in. dia.

Cyril Bath Company's new radial draw form machine uses an additional hydraulic ram to grip tapered sheets in such a way that the thin end is not overstressed while the thick end is being stretched to shape. Additional ram is shown here hitting the center of the work from the left while the conventional part of the machine grabs each end of the work as it is stretched over the contour block. Tapered skins are becoming more prevelent for high performance aircraft and Cyril Bath claims its method is more direct than either joining skins of different thicknesses or machining a taper, then stretching.



Pegasus Laboratories, Berkeley, Mich., Inc., a new servomechanisms manufacturer, is said to be rapidly expanding into the aviation field.

Navy Contracts

Following is a list of unclassified contracts of $25,000 and over as released by Navy Contracting Offices:

U. S. NAVAL SUPPLY ACTIVITIES, Brooklyn 32, N. Y.

Aerolab Development Co., 330 West Holly St., Pasadena 3, Calif., model aircraft target devfee N140(71339)57133B (reqn. No. 61339/60060/56), 62 ea, $26782.

Radio City Products Co., Inc., Centre & Glendale Sts., Easton, Pa., clipboard pilots type, N140(229)57154B (IFB-N140-988-56), 14401 ea, $40446.

AVIATION SUPPLY OFFICE, 700 Robbins Ave., Philadelphia 11, Pa.

B. F. Goodrich Industrial Products Co., Div. of the B. F. Goodrich Co., 500 S. Main St., Akron 18, Ohio, hose; rubber aircraft, (IFB-383-1148-56), various, $168,558.

Aviators Clothing Co., Inc., 143 Main St., Beacon, N. Y., jackets and trousers, (JD-

Here is the versatile Pastushin Slug Rivet that gives absolute Fluid-Tight Construction

This photomachrograph of a sectioned specimen illustrates the sealing principle of the Pastushin Slug Rivet. Standard sizes 5/32"–3/16"–1/4" ...other sizes available.

The Pastushin fluid-tight slug rivet seals automatically. The exclusive fluid-tight seal is accomplished by the extrusion, or flow, of the .004 wall 1100 aluminum alloy sleeve into possible leak areas of the hole when the rivet is expanded during driving. Positive sealing is accomplished without the addition of foreign sealing agents.

Because Pastushin Slug Rivets do not have preformed heads, uniform flow of rivet shank material in the flush head and upset end is assured during the driving process.

PASTUSHIN REPLACEMENT RIVETS: For production or field maintenance, three types are available, Jacket, Washered, and Washer-Jacketed. Like the slug rivet, they are fluid-tight, have full rivet strength and are easy to install with conventional tools and methods.

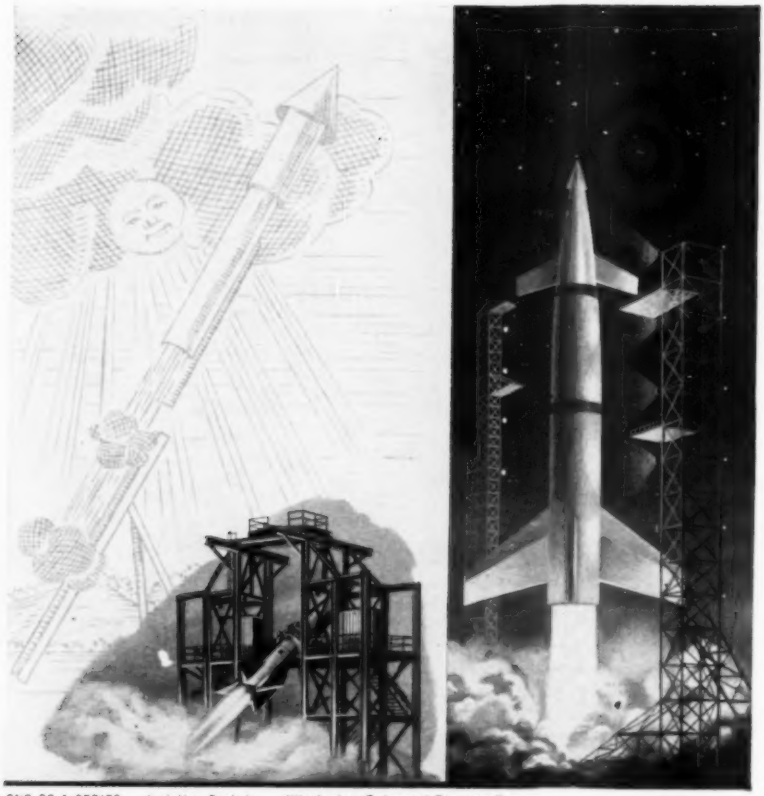
Write for Slug Rivet catalog PI-5 and No. PA-3 for details on the Pastushin repair kit.

PASTUSHIN *Industries Inc.*

5651 WEST CENTURY BOULEVARD, LOS ANGELES, CALIFORNIA

Developers and Manufacturers of Aircraft Fasteners

Affiliate Companies { **PASTUSHIN AVIATION CORP.**, Los Angeles, California
HAWAIIAN AIRMOTIVE, LTD., Honolulu, Hawaii



ONE OF A SERIES — depicting Rocketry — "Yesterday, Today and Tomorrow"

from the tartar wall to the moon

The Battle of Kai-fung-fu in 1232 . . . Ft. McHenry in 1814 . . . Goddard's experiments in 1920 . . . the supersonic Bell X-1 in 1947 . . . these were milestones in rocketry. Slowly evolving into today's potent weapon, the rocket is still more than a weapon . . . it is man's escape route into space.

Before this frontier can be achieved, tremendously complex problems must be solved. Intriguing problems that challenge the ingenuity of even the most creative engineer. These problems are being solved every day by Bell Aircraft's engineering teams.

Bell's rocket engine division has designed and built numerous successful rocket engines for different Army, Navy and Air Force projects, including the Nike and Rascal guided missiles. In a continuing research program complete facilities are available, including 44 test cells capable of conducting over 400 test runs a month.

For the imaginative engineer with a sincere interest in his professional future and a wide choice in career opportunities, contact . . .

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IFB-383-1283-56), various, $377,144.

Goodyear Aircraft Corp., 1210 Massillon Rd., Akron 15, Ohio, valve asys, (383/28011-7A1/9/56), various, $32,061.

United Chromium Div., Metal & Thermit Corp., 100 E. 42nd St., N. Y., 17, N. Y., compound, (383/29081-3771G4/4/56), various, $62,916.

Lavoie Labs, Inc., Matawan-Freehold Rd., Morganville, N. J., oscilloscopes, (383/29069-204-E-2/6/56), 142 ea., $278,103.

Consolidated Diesel Electric Corp., Ludlow & Canal Sts., Stamford, Conn., load-bank resistors, (383/29065-109S2/3/56), various, $27,282.

Foote Bros. Gear and Machine Corp., 4545 South Western Blvd., Chicago 9, Ill., actuator assys, and maintenance parts, (383/2150-1498x1/3/52/AERO), various $72,253.

Magnaux Corp., 7300 W. Lawrence Ave., Chicago 31, Ill., penetrants, (38329071-353G4/4/56/AERO), various, $26,678.

Consolidated Diesel Electric Corp., Ludlow & Canal Sts., Stamford, Conn., test sets-NT 1, (383/29065-88S2/2,3/56), various, $335,901.

Aerial Machine & Tool Corp., 37-27 30th St., Long Island City, N. Y., aero 48A sling, (IFB-383-978-56), 467 ea., $36,519.

Sheet Metal Specialty Div., Follansbee Steel Corp., State St., P.O. Box 567, Follansbee, West Va., container assys., (IFB-383-1533-56), 33200 ea., $26,597.

Chandler Evans Div., Pratt & Whitney Co., Inc., W. Hartford 1, Conn., parts for carburetors (3832116-12/8x3/4/53), various, $89,719.

Jowil Electronics Inc., Belfield Ave. & Wister Sts., Philadelphia 44, Pa., control box testers, (383/29069-203E2/8/56), various, $140,210.

Bendix Products Div., Bendix Aviation Corp., South Bend, Ind., parts for various A/C (383/2116 155x3/4/53), various, $51,-704.

Ingersoll Rand Co., 2037 Chestnut St., Philadelphia 3, Pa., parts for compressors, (383/23263-215S31/56), various, $86,564.

Stratos Div., Fairchild Engine & Airplane Corp., Bay Shore, L. I., N. Y., services of material, (383/23055-37x2/1/56), 209 ea., $116,673.

Singer Sewing Machine Co., 149 Broadway, N. Y. 6, N. Y., sewing machines, (383/23263-198S3/17188/56/AERO), various, $51,430.

Turco Products, Inc., Los Angeles, Calif., cleaning compound, (38329081-3569G4/4//56 AERO), 147538 gal., $272,815.

Taunton Engineering Works, 700 W. Water St., Taunton, Mass., masts: mobile, mooring, EMN type, (383/29065-48S3/21/56/AERO), various, $148,050.

Loral Electronics Corp., 794 E. 140th St., N. Y. 54, N. Y., test sets:, (38329060-158E2/6/56,383/2110-8381/56), various, $209,910.

Eclipse-Pioneer Div., Bendix Aviation Corp., Teterboro, N. J., testers, (38329067-14-S-2/3/56/AERO), 534 ea., $296,124.

Burner-Holloman Mfg. Corp., 4706 Rhode Island Ave., Hyattsville, Md., engine stands, (JD-383/23263-156S2/6/7/56/AERO), various, $289,522.

Aircraft Radio Corp., Boonton, N. J., test sets, (38329069-72-E-2/6/56/AERO), various, $200,400.

The Electric Auto-Lite Co., 1201 Champlain St., Toledo 1, Ohio, spark plugs, (383/2117-197/52), 274026 ea., $327,460.

Lockheed Aircraft Corp., P.O. Box 551, Burbank, Calif., ground equipment for TV aircraft, (383/2110-1424/52/AERO), various, $33,696.

United Mfg. Co., Div., W. L. Maxon Corp., 41 Haig St., Hamden 14, Conn., reduced voltage starters, (383/29069-2S2/2/56), 44 ea., $43,619.

Duracote Corp., 350 N. Diamond St., Ravenna, Ohio, fiberglass cloth, (383/29081-1072G3/3/56), various, $90,130.

The Firewel Co., Inc., 3685 Broadway, Buffalo 25, N. Y., oxygen regulator, (383/29043-25G3/3/56), 116 ea., $33,640.

Polarad Electronics Corp., 43-20 34th St., Long Island City 1, N. Y., test set radios, (JD 383/29069-206-E2/6/56), various $184,-652.

Hetherington Inc., 1200 Elmwood Ave., Sharon Hill, Pa., spare parts, (383/29031-452E4/3/56), various, $41,799.

Waukesha Motor Co., Waukesha, Wis.,

auxiliary power plants (383/29065-136S2/2/56), 175 ea., $259,238.

Jetronic Industries, Inc., Main & Cotton Sts., Philadelphia, Pa., radar test sets, (383/29069-4 E2/6/56), various, $215,999.

David Clark Co., Inc., 360 Park Ave., Worcester 2, Mass., flight deck helmets, (383/29045-111G3/25/56), various, $281,349.

Pioneer Parachute Co., Inc., 168 Forest St., Manchester, Conn., parachute assys, (383/2904561G3/4/56), various, $1,919,272.

Eclipse-Pioneer Div., Bendix Aviation Corp., Teterboro, N. J., indicator testers, (383/29067-40S3/3/56), various, $27,495.

The Amco Corp., 1720 Callowhill St., Phila. 30, Pa., units and spare parts; portable fuel pump, (JD-IFB-383-1268-56), various, $31,295.

Arrow Lacquer Corp., 208 Dupont St., Brooklyn 22, N. Y., lacquer, (IFB-383-1189-56), 20232 gals, $44,555.

Minnesota Rubber and Gasket Co., 3630 Wooddale Ave., Minneapolis 16, Minnesota, seals; "O" rings, (IFB-383-999-56), various, $50,604.

General Electric Co., 1405 Locust St., Phila., Pa., controllers used on G. E. starters, (383/2117-219/51/AERO), 128 ea., $27,648.

Bendix Products Div., Bendix Aviation Corp., South Bend, Ind., parts used on fuel controls, (8/2117-283/51), various, $222,840.

Walter Kidde & Co., Inc., Belleville, N. J., control valves, (383/2150-1486x2/4/52/AERO, 383/2150-1546x2/4/52/AERO), 3107 ea., $43,405.

North American Aviation, Inc., Columbus Div., 4300 E. 5th St., Columbus, Ohio, parts, armament, (3832155-71A6/3/52/AERO), various, $29,160.

Telephonics Corp., Park Ave., Huntington, L. I., N. Y., headset assys, (383/29031-450-E2/5/56), various, $123,198.

General Electric Co., 1405 Locust St., Philadelphia 2, Pa., bearings, (383/29081-3494G2/4/56/AERO), 3900 ea., $28,013.

General Textile Mills Inc., 450 Seventh Ave., New York 1, N. Y., helmets, (383290-45115G316/56/AERO), 8320 ea., $199,680.

United States Steel Products Div. of United States Steel Corp., 1625 K St., N. W., Washington, D. C., drums; metal, (383/29081-2474G2/3/56/AERO), 6186 ea., $38,493.

The B. F. Goodrich Co., 500 S. Main St., Akron 18, Ohio, boots; deicer, (3832150-1717x7/3/51/AERO), various, $47,933.

Holley Carburetor Co., 11955 E. Nine Mile Rd., Van Dyke, Mich., maintenance parts to support various engines, (MIPR41-608-5-03D-1192 Amend. 3, 3A and 3B), various, $163,957.

Dalmo Victor Co., Div. of Textron American Inc., 1414 El Camino Real, San Carlos, Calif., bearings, (383/29081-3258G2/4/56/AERO), various, $29,252.

Eclipse-Pioneer Div., Bendix Aviation Corp., Teterboro, N. J., technical publications, (PDEN11-5480/56(737-55), various, $87,348.

Army Contracts

Following is a list of unclassified contracts of $25,000 and over as released by Army Contracting Offices:

CORPS OF ENGINEERS, U. S. Army, Office of the District Engineer, Los Angeles District, 751 S. Figueroa Street, Los Angeles 17, Calif.

Peter Kiewit Sons' Co. and Fredericksen & Kasler, 345 Kleways Ave., Arcadia, Cal., Missile Electronics Bldg., Edwards Air Force Base, Edwards, Cal., (Negotiated), job, $639221.

CORPS OF ENGINEERS, U. S. Army, Office of the District Engineer, Tullahoma District, P. O. Box 2091, Tullahoma, Tenn.

Allis-Chalmers Mfg. Company, Buda Division, Harvey, Ill., furnishing diesel-electric generator unit for the Ram Jet addition to the engine test facility, Arnold Engineering Development Center, Tullahoma, Tenn., (IFB ENG-40-126-56-49), job, $28222.

SAVANNAH DISTRICT, Corps of Engineers, 200 E. St. Julian St., Savannah, Ga.

E. F. Higginbotham, Jr., 1400 Third Ave., Brunswick, Ga., construction of United

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States Air Force Facility. Unmanned gap filler, on Blythe Island, near Brunswick, Ga. (IFB ENG-09-133-56-43), job, $32976.

CORPS OF ENGINEERS, U. S. Army, Office of the District Engineer, Albuquerque District, P. O. Box 1538, Albuquerque, N. M.

C. H. Leavell & Co., 1900 Wyoming St., El Paso, Tex., construction of static missile laboratory, Holloman Air Force Base, Alamogordo, N. Mex. contract No. DA-29-005-ENG-1691, (IFB ENG-29-005-56-68), job, $751100.

George A. Rutherford, Inc., 915 Hazeldine Avenue, S.E., Albuquerque, N. Mex., construction of hangar, ready Nov. 1 ADC, shop maintenance organizational specs, and ammunition storage and shop, Kirtland Air Force Base, Albuquerque, N. Mex. Contract No. DA-29-005-ENG-1692 (IFB ENG-29-005-56-12), job, $354000.

USAF Contracts

Following is a list of unclassified contracts for $25,000 and over as released by Air Force Contracting Offices:

WARNER ROBINS AIR MATERIEL AREA, Robins Air Force Base, Ga.

Tower Construction Co., 2700 Hawkeye Drive, Sioux City, Iowa, furnishing and erection of Steel Towers (RFP-9343, local purchase), $26618.

Farrand Optical Co., E. 238 St., New York 70, N. Y., kits for modification of the Y-3 bombsight (PR-407958), $74806.

Spartan Tool Co., 1918 Columbia Ave., Chicago 26, Ill., pipe and sewer cleaner, portable, electric, 4" pipe cap, 250 ea (RFP-1295), $34633.

Sperry Gyroscope Co., Great Neck, Long Island, N. Y., modification kits applicable to ME-5 bombing navigational computer (PR-408058), $33985.

Aircraft Tools, Inc., 9030 Bellanca Ave., Los Angeles 45, Calif., dimpling machines, portable, Type 2, (IFB-312), $92549.

Western Electric Co., Winston Salem, N. C., modification kits for Class 11A bombing systems, $1277491.

Aeroproducts Operations Div., GMC, Dayton, Ohio, modification kits for propellers, $76195.

General Electric Co., Johnson City, N. Y., reproducible copy for operations, overhaul and parts breakdown instructions (PR-584-506), $55029.

Randall Mfg. Co., 801 Edgewater Rd., New York 59, N. Y., radiator descaling machines IAW Spec Mil-D-4564, 134 ea (IFB-353), $42063.

Ingersoll-Rand Co., Birmingham, Ala., pneumatic wrench, reversible impact type, Class 2 (Items 3, 4 & 5, IFB-414), $257102.

Aro Equipment Corp., Bryan, Ohio, pneumatic wrench, reversible impact type, (Items 1 & 2, IFB-414), $178047.

Thor Power Tool Co., 175 No. State St., Aurora, Ill., pneumatic wrench, reversible impact type (Items 6, IFB-414), $49665.

Farrand Optical Co., Inc., Bronx Blvd., & E. 238th St., New York 70, N. Y., modification kits for Y-3 periscopic bombsight (PR-407957), $80886.

Thor Power Tool Co., 175 No. State St., Aurora, Ill., pneumatic hammer, reciprocating (RFP-1014), $46160.

Curtis Wright Corp., Caldwell, N. J., repair and/or modification, test, preservation and packaging propeller blades (PR-734714-2, 734981), $500000.

Apex Machine Co., 14-13 118th St., College Point 56, N. Y., machines, wire marking and identification, Type 1, Spec Mil-M-4528, 92 ea (IFB-335), $33304.

The Peck, Stow and Wilcox Co., Southington, Conn., shear, squaring, foot powered, 18 ga x 96 in, 98 ea (IFB-356), $94570.

SAN BERNARDINO AIR MATERIEL AREA, Norton Air Force Base, Calif. Procurement Division, Director of Procurement and Production.

Shaw & Estes and Associates, 1407 S. Akard St., Dallas, Tex., complete jet engine shop installation, Building 747, Norton AF Base, San Bernardino, Calif. IFB 04-607-56-119, job, $1429418.

BROKEN COVER of gear box where propeller tore away (top left). Prop blade chopped across top of No. 3 engine on starboard side (top right) ripped into cabin (bottom left) and cut through opposite side (bottom right).

Propeller Rips Cabin of TCA Viscount

A propeller broke loose from an airliner carrying 34 passengers above Flat Rock, Mich.

The metal prop ripped through the cabin of the Trans-Canada Airlines Viking Viscount, bound from Chicago to Toronto, killing one woman and injuring five other passengers.

Officials have blamed the tragedy on a "runaway propeller" which overspeeded uncontrollably until a blade tore itself free.

The craft is a turboprop, built in England.

The dead woman, Mrs. Mary Lippert, wife of Dr. Robert Lippert of the Mayo Clinic in Rochester, Minn., was sitting in the front right seat of the aircraft. Her two small sons, one aged three and one 21 months, were occupying the seat beside her and were uninjured (although the three year-old was treated for shock).

Officials said the children's seat was in the reclining position and attributed this to their escaping injury.

Others injured were Christopher Dumbell, Dubuque, Iowa—crushed left leg; his wife Donna and their son, Donald, 3—leg injuries. The Dumbells were sitting across the aisle from the Lipperts in a front seat.

Donovan Stevens of Mundelein, Ill., was cut severely on the back of the neck.

At 1346 hours the Air Route Traffic Control of the CAA at Detroit-Wayne Major Airport received a radio call from Captain Robert Smuck of the TCA aircraft.

He reported that his aircraft was at 19,000 ft. with a propeller out of con-

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trol and that he had shut off his #4 engine on the starboard side.

A moment later he reported he had lost the prop and asked emergency clearance to land at Windsor Airport—which was granted.

Between the time of the first radio call and the last, a woman in Flat Rock, Mich. called Flat Rock and told them a piece of an airplane had fallen in a field.

Police found one of the blades of a four-bladed prop in the field.

Small Fire

When the propeller flew off #4 engine it struck the inboard starboard engine and caused a small fire that was quickly extinguished. Captain Smuck said he could not use the damaged engine and shut it down also. One propeller blade on the inboard starboard engine was bent by the impact of the flying blade.

Captain Smuck and co-pilot A. C. Adamson said the propeller went out of control and spun much faster than normal for about four minutes before it broke away.

After breaking loose and striking the inboard engine the propeller tore through the fuselage of the plane, making a hole through both sides.

Entered Window

The propeller entered the fuselage at the window area, tore across the front seats and then exited at the window area on the port side.

Passengers and officials were high in their praise of the skill shown by Captain Smuck in landing the aircraft with only two engines functioning, both on the port side.

Captain Smuck is a TCA check pilot. He was flying a normal proficiency check with Adamson, regular pilot on the run.

Fire Light On

Smuck said that the breaking propeller hit the top of the inboard engine causing a fire light to go on in the cockpit—although Smuck said he saw no fire.

Passengers also praised the actions of the two stewardesses, Misses Sheila Thomson and Rita Tobin, both of Toronto.

The stewardesses took children to the rear of the plane and generally acted in a manner that has become traditional in airlines operation. Neither stewardess was hurt although both were treated for nervousness at the Windsor hospital.

Frank I. Young, region operational manager for TCA, is conducting an investigation with Canadian and U. S. officials.

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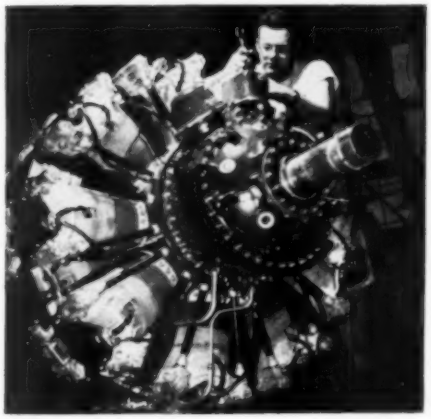

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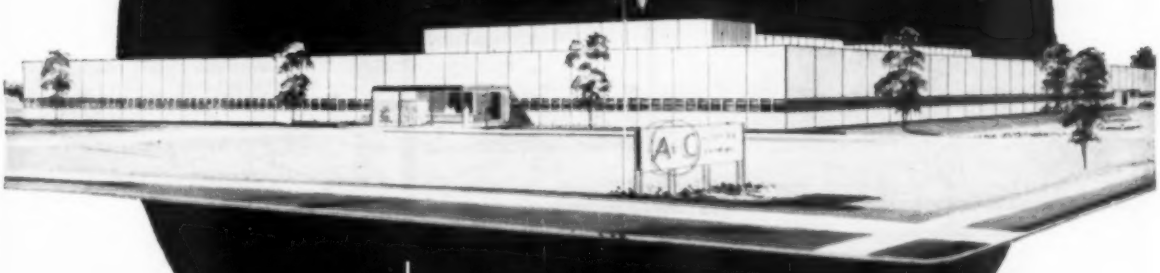

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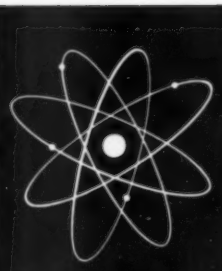

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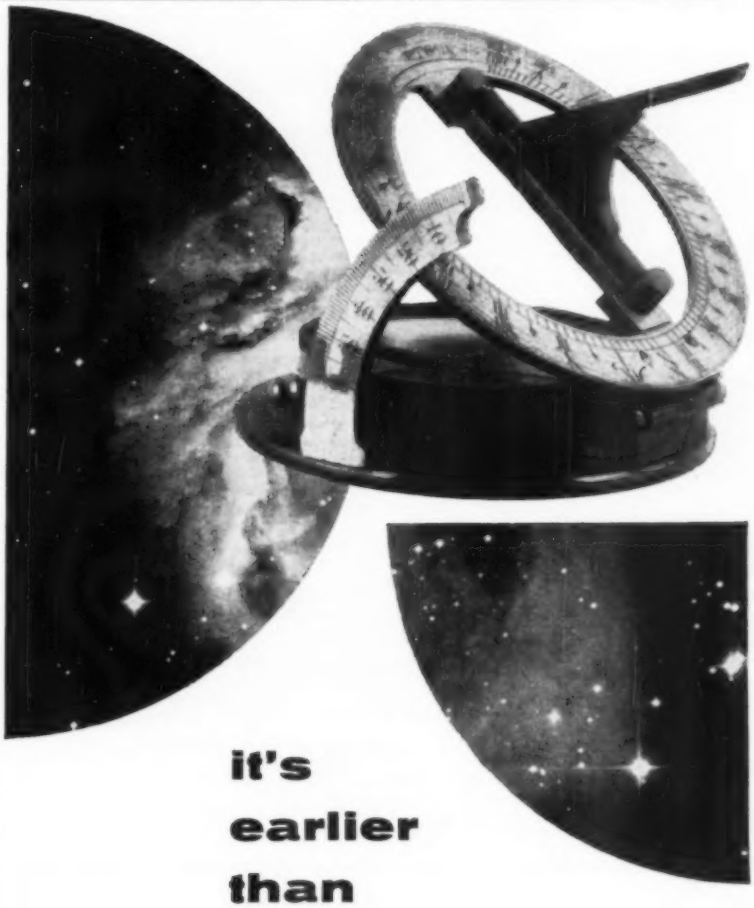

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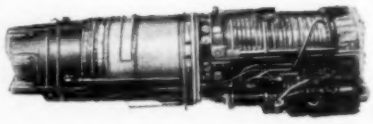

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LETTERS

United-TWA Tragedy

You foretold this. Now for the good of aviation, don't play it down. Put it on the front page and keep it there. One reasoning voice must ring out above the clamor until the traffic problem is solved. In the name of God, give it all you've got.

James D. Burke
Altadena, Calif.

Free Enterprise

In all the letters you have published concerning the controversy over whether or not there is an engineering shortage and what to do about it, the most important point has been overlooked; the built-in compensating device which the free enterprise system uses to increase or decrease the availability of any product or skill, the Law of Supply and Demand.

However, we spend billions of dollars each year to thwart this basic facet of our economic system through subsidies to various groups and other devices. Industry is following the same pattern in this engineering shortage. Large amounts have been appropriated for propaganda to encourage school children to take mathematics and scientific subjects, but agreements limiting engineering salaries and increases for job jumping have kept the basic ratio between engineering and average industrial wages at the same figure it has always been. I am not saying that the chaos caused by indiscriminate pirating of engineering talent would be beneficial to the country. But I would like to call attention to the fact that medical schools now receive twenty applications for every opening. In other words if a few years ago Congress had approved the bill to build medical schools at government expense, the number of new doctors graduated each year would soon be many times what it is today. That is because doctors' incomes average about three times that of engineers.

Admittedly, improved secondary school instruction, higher starting salaries, and more glamorous publicity about engineering will help the situation. But the basic factor has apparently been overlooked. Russia has artificially set engineers' salaries at six to seven times that of the average workman's wage. The salary of those who have scientific doctors degrees is comparable to a factory manager's. That is the real secret behind the fanatical determination of young Russians to excel in scientific skills.

Our free enterprise system has demonstrated that it can cope with any problem better than competing systems. I believe deeply that it can also succeed in conquering the engineering shortage if given the chance.

G. E. Engineer

Puzzled On Gear

The latest issue of AVIATION WEEK (June 11) contains an article on p. 111 about a new crosswind gear developed for Beech Aircraft. I read the article with a great deal of interest as well as confusion. The article repeatedly states that the downwind wheel will caster due to side loads, etc., etc. Is this beneficial????

I am just a lowly private pilot with a limited background in engineering, but I am afraid it would scare the living daylights out of me to attempt a crosswind landing with such a gear. I definitely feel that I would want the upwind wheel to caster under me, not the downwind wheel.

I am wondering if some mix-up has occurred in spite of the numerous times that the wheel is defined as downwind in the article. Or else I would like to have a more detailed report upon the action of this gear so that I can more clearly understand it.

PAUL A. CARLSTEDT
9055 Phinney Ave.
Seattle 3, Wash.

In crosswind landing, the downwind wheel is the farthest from the wind direction (example: if wind is from the left, the right wheel is downwind). When an airplane lands in a crabbed position, the greatest percentage of weight is naturally on the downwind wheel. In crabbed landings, the Geisse Safety Gear automatically casters the downwind wheel, relieving the load and almost completely eliminating any ground loop tendency. No benefits would result from castering of the upwind wheel.

Aviation Week welcomes the opinion of its readers on the issues raised in the magazine's editorial columns. Address letters to the Editor, Aviation Week, 330 W. 42 St., New York 36, N. Y. Try to keep letters under 500 words and give a genuine identification. We will not print anonymous letters, but names of writers will be withheld on request.

Army Air Transport

This is in answer to "Artillery Captain" which appeared in the letters section of the May 28, 1956 issue of your magazine.

I will endeavor to explain to the Captain why I think the Army has not been given the responsibility for airlifting their own troops in fixed wing assault transports. Before answering the Captain, however, I would like to say that this writer has been associated with the Army Aviation Program for the past three years and therefore I feel capable of replying to the Captain's biased letter.

If the Captain would be so kind as to go back and re-read the article he references, he will find that the Air Force, by far, has the greatest backlog of cockpit and maintenance experience on large transport and cargo type aircraft. Moreover, the Eighteenth Air Force is dedicated to becoming thoroughly familiar with its primary mission—the air movement of troops. Why, then, should this responsibility (the airlifting of troops) be surrendered to a service which is relatively inexperienced in the air and primarily "hidebound" to the traditional concept of surface transportation? Has the Captain forgotten why the former "Army Air Force" divorced itself from the Army in 1947? Wasn't a separate Air Force created to prevent our proud air armada from being diluted by the "separate requirements" of ground-bound commanders?

Furthermore, why doesn't the Captain's "reasoning" be carried one step farther and suggest that the Army usurp the Navy's responsibility for the movement of troops by sea-going troop transports? Would he be so brash as to infer that the Navy (which also possesses a fair backlog of experience in nautical operations) should yield the responsibility for the movement of troops by sea to the land-bound Army?

In other words, if the Artillery Captain thinks that there should be an "Army Air," what is preventing him from thinking that there should also be an "Army Sea?" The Captain would do well to read and ponder the fine editorial presented by Robert Hotz in the same issue of AVIATION WEEK. We may be closer to unification (of the armed services) than we think.

ADVOCATE OF UNDILUTED AIR POWER

Wrong Company

May I call to your attention the picture of the Portable Aircraft Preheat Units which was printed in the May 28 edition of AVIATION WEEK, page 85. In the story beneath the picture, the Les Bowman Engineering Company was given credit for the manufacturing of these units. Apparently someone has been misinformed, and I wish to make a correction.

These units were built and sold to the Slick Airways, Inc. (among others), by the George C. Burnham Company. The engines were purchased from the Kohler Company through the Les Bowman Company, but all other procurement, work and sales was done by George Burnham. The picture was taken and presented to the Kohler Company by George Burnham.

Having a little "blurb" like that printed in AVIATION WEEK is such a good bit of publicity we hate to let it go.

GEORGE C. BURNHAM
George C. Burnham Company
516 No. Pacific Coast Highway
Redondo Beach, Calif.

F-102A Supplier

As a subscriber to your very fine magazine, AVIATION WEEK, we wish to call to your attention an article in the May 21 issue, p. 76, titled "F-102A Bulkhead Wing Spar Forging Assembled," in which you mentioned the fact that Wyman Gordon and the Aluminum Company of America are producing forgings for the F-102A.

We think you should know that the Bridgeport Brass Company is also another major supplier of these parts, and we are sure that Convair would be happy to verify this due to the outstanding quality performance of Bridgeport Brass Company.

C. L. COLLINS
Forge Sales Manager
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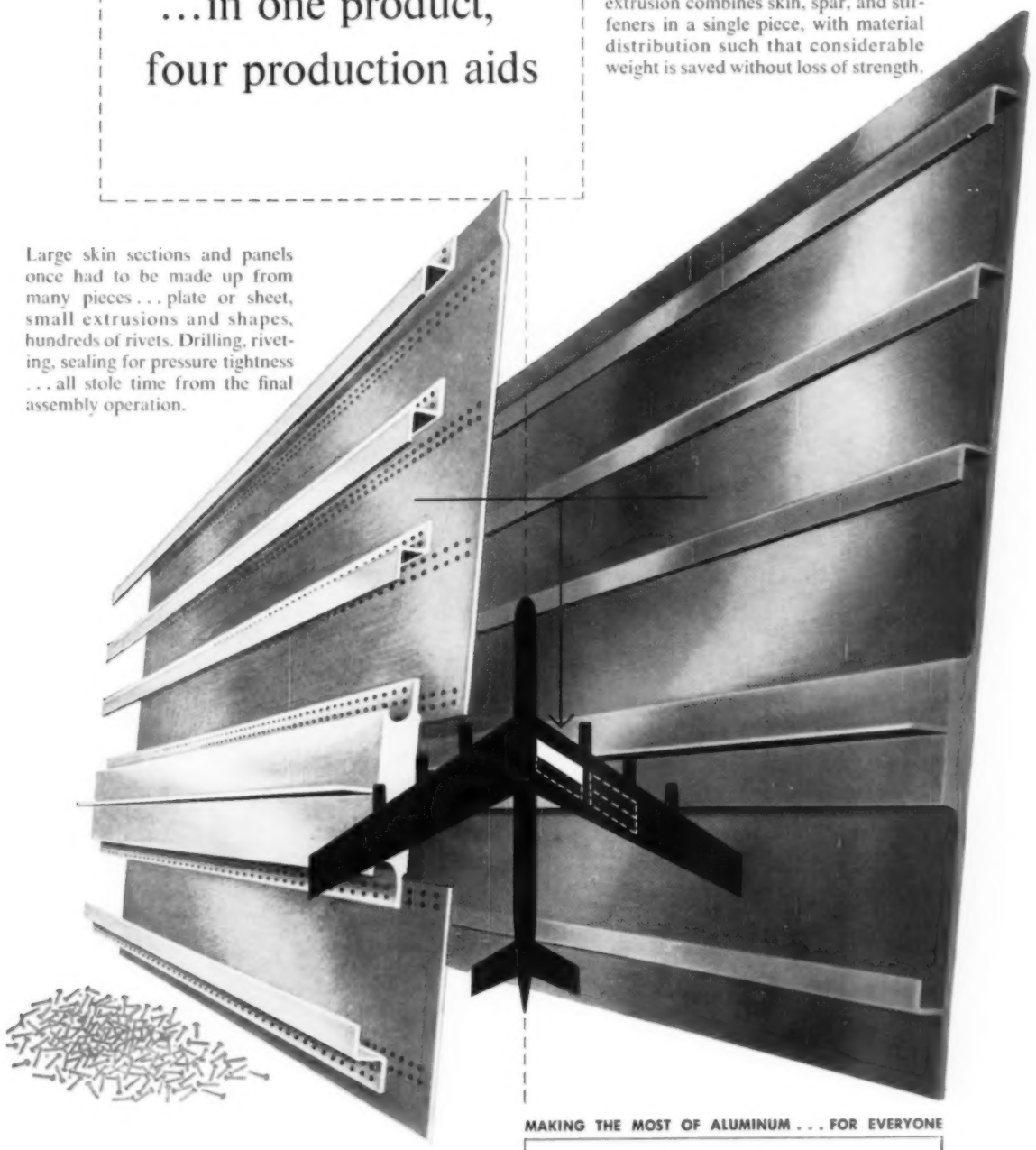

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Here you see the Tactical Air Command's newest reconnaissance bomber—the all-weather twin-jet Douglas RB-66.

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Now winning its wings for reliability and dependability with the 363rd Tactical Reconnaissance Wing at Shaw Air Force Base, S. C., the Allison-powered RB-66 carries a three-man crew as it goes on its peace-maintaining missions.

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